

CHAPTER 13

WINTERIZATION INSTRUCTIONS

SECTION I. GENERAL

13-1. Introduction

a. Scope. This chapter contains information for the installation, removal, and maintenance of the winterization kits for the rocket motor cluster (fig. 13-1), the APS (fig. 13-21), and the missile battery box.

b. Purpose. For efficient operation in extreme cold weather, the rocket motor cluster and the APS must be maintained at or above minimum operating temperatures. The minimum operating temperature is -20°F for the rocket motor cluster and $+30^{\circ}\text{F}$ for the APS. These minimum temperature requirements are maintained through the use of winterization kits, which are designed to be launched with the missile and need not be removed because of seasonal changes.

13-2. Physical Description

a. Rocket Motor Cluster Winterization Kit. This kit contains a forward insulation blanket; four heating blankets; a cover plate; four rear insulation blankets; four honeycomb fairings; four fairings; two thermometer assemblies, each assembly containing six thermometers, six capillary tubes, and six thermometer bulbs; and the necessary hardware to install these items.

b. APS Winterization Kit. This kit contains an APS heating blanket, an access cover plate insulating blanket, and a missile battery box insulation blanket.

13-3. Functional Description

a. Rocket Motor Cluster Winterization Kit. Four heating blankets hold the temperature of the rocket motors above $+15^{\circ}\text{F}$, if the am-

bient temperature is below $+15^{\circ}\text{F}$. One blanket encircles each rocket motor. When the temperature within the blanket becomes less than $+15^{\circ}\text{F}$, the thermostats close and connect it across 3-phase, 120/208-volt, 400-cycle power supplied from the distribution box on the launcher. When the temperature becomes greater than $+15^{\circ}\text{F}$, the thermostats open. The cycle repeats itself as often as required. In order to equalize the load on the power source, each heating blanket contains three heaters of equal capacity connected across a separate phase. Two thermometer assemblies (fig. 13-1) are provided to indicate whether the blankets are functioning properly.

b. APS Winterization Kit. The APS heating blanket is installed around the APS to hold the temperature of the APS above $+35^{\circ}\text{F}$, if the ambient temperature is below $+35^{\circ}\text{F}$. When the temperature within the area surrounded by the APS heating blanket and the access cover plate insulating blanket becomes less than $+35^{\circ}\text{F}$, the thermostat closes and connects the APS heating blanket across phase B power. When the temperature becomes greater than $+35^{\circ}\text{F}$, the thermostat opens. If the APS heating blanket fails to operate, and the temperature becomes less than $+15^{\circ}\text{F}$, the monitor thermostat closes, and the appropriate HEAT MONITOR indicator light illuminates on both the launcher control-indicator and the section control-indicator.

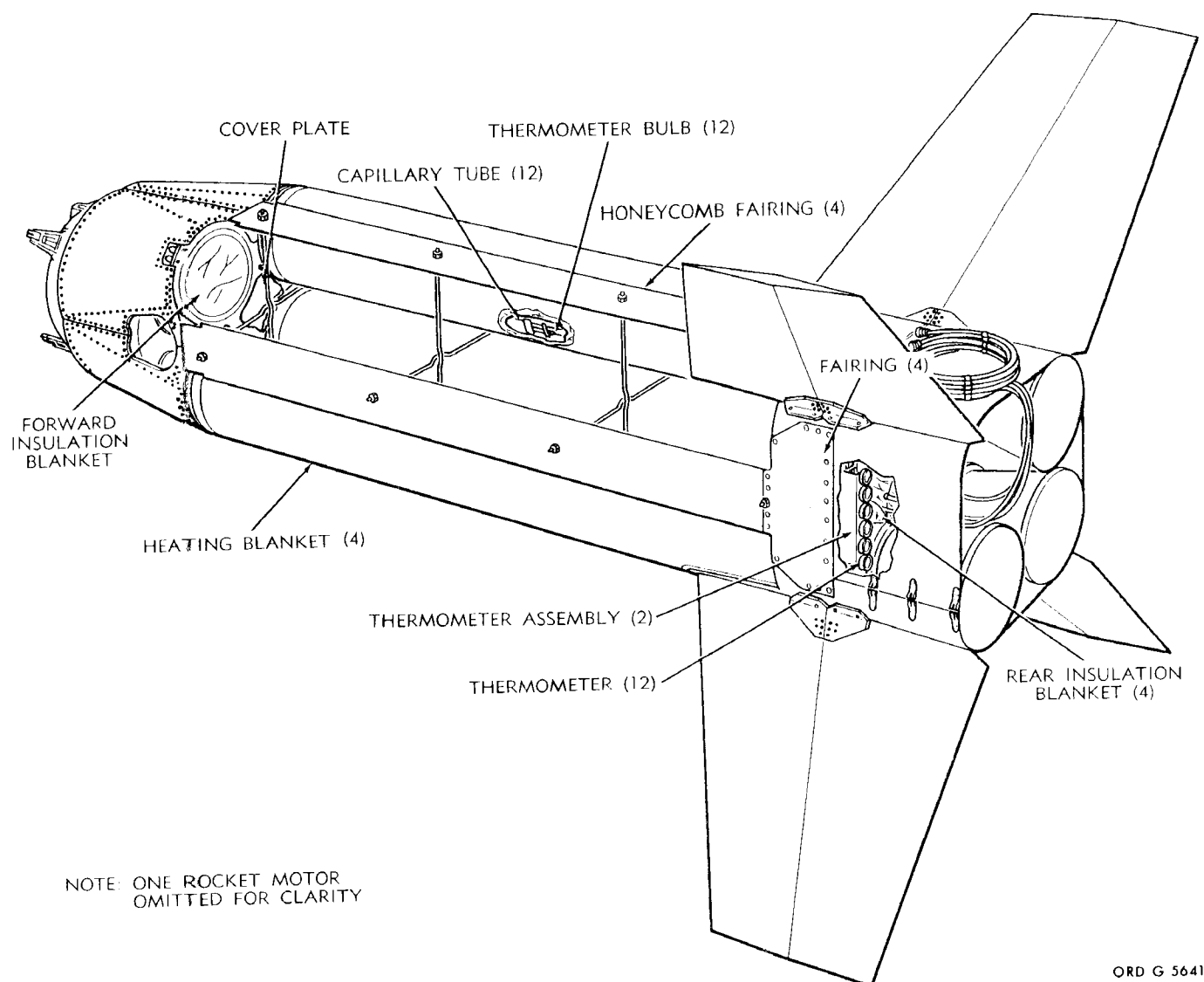


Figure 13-1. Winterization Kit for the rocket motor cluster.

Table 13-1. Rocket Motor M5E1 or Cluster M42—Safe Firing Temperature

| Outside temperature | Safe temperature firing limit Degrees F | Initial temperature of motor | | | | |
|---------------------|--|------------------------------|---------------|---------------|--------------|---------------|
| | | 75°F | 60°F | 45°F | 30°F | 15°F |
| Minus 20 | Plus 10 | Hours 19.4 | Hours 16.0 | Hours 12.2 | Hours 7.0 | Hours 0.09 |
| | 0 | 27.3 | 23.9 | 20.1 | 15.0 | 8.6 |
| | Minus 10 | 40.9 | 37.4 | 33.7 | 28.8 | 22.1 |
| | Minus 20 | | | | | |
| Minus 30 | Plus 10 | 16.9 | 13.0 | 9.8 | 5.2 | 0.7 |
| | 0 | 22.5 | 18.6 | 15.4 | 11.1 | 6.1 |
| | Minus 10 | 29.6 | 26.6 | 23.3 | 11.1 | 14.0 |
| | Minus 20 | 38.2 | 37.0 | 33.5 | 29.2 | 24.4 |

*Table 13-1. Rocket Motor M5E1 or Cluster M42—Safe Firing Temperature—
Continued*

| Outside temperature | Safe temperature firing limit Degrees F | Initial temperature of motor | | | | |
|---------------------|--|------------------------------|------|------|------|------|
| | | 75°F | 60°F | 45°F | 30°F | 15°F |
| Minus 40 | Plus 10 | 13.6 | 11.1 | 8.0 | 4.00 | 0.5 |
| | 0 | 18.1 | 15.4 | 12.5 | 8.9 | 4.8 |
| | Minus 10 | 23.7 | 21.0 | 18.2 | 14.5 | 10.4 |
| | Minus 20 | 30.4 | 27.9 | 25.1 | 20.8 | 17.3 |
| Minus 50 | Plus 10 | 12.0 | 9.6 | 6.8 | 3.1 | 0.3 |
| | 0 | 15.8 | 13.2 | 10.6 | 7.4 | 3.9 |
| | Minus 10 | 20.6 | 17.4 | 15.0 | 12.0 | 8.3 |
| | Minus 20 | 26.4 | 22.2 | 20.0 | 16.9 | 13.5 |
| Minus 60 | Plus 10 | 10.4 | 8.3 | 5.7 | 2.1 | 0.2 |
| | 0 | 13.6 | 11.5 | 9.2 | 6.3 | 3.2 |
| | Minus 10 | 17.3 | 15.1 | 12.7 | 10.3 | 6.8 |
| | Minus 20 | 21.5 | 19.1 | 16.2 | 14.5 | 11.0 |

13-4. APS and HPU Low-Temperature Operation Limitations

a. Certain limitations in the operation of the APS without a winterization kit and the HPU are required during extremely cold weather. The minimum operating temperature of the APS without a winterization kit and the HPU with MIL-H-5606 hydraulic oil is +30°F, and the length of time the missile can be exposed to outside ambient temperatures below +30°F is determined in accordance with figures 13-3 and 13-4.

b. Perform the procedures before to determine the length of time the missile can be exposed to outside ambient temperatures below +30°F.

(1) Determine the storage chamber temperature from which the missile was removed, and select the applicable curve (fig. 13-3).

(2) Determine the outside ambient temperature.

(3) On figure 13-3, from the point of intersection of the storage chamber temperature

curve and the outside ambient temperature line, read down the vertical line to determine the outside exposure time in hours.

(4) Determine the wind velocity.

(5) On figure 13-4, determine the wind velocity correction factor.

(6) Multiply the outside exposure time in hours determined in step (3) above by the wind velocity correction factor determined in step (5) to determine the length of time the missile can be exposed to outside ambient temperatures below +30°F. **EXAMPLE:** If the storage chamber temperature is +50°F and the outside ambient temperature is -25°F, the outside exposure time is 1 hour (fig. 13-3). If the wind velocity is 30 miles per hour, the correction factor is 0.82 (fig. 13-4). Multiply 1 hour by 0.82, and the length of time the missile can be exposed is 0.82 hour.

Figure 13-2. (Deleted)

c. For sustained exposure of the missile to temperatures below +30°F, refer to paragraph 4-2 and 4-9.

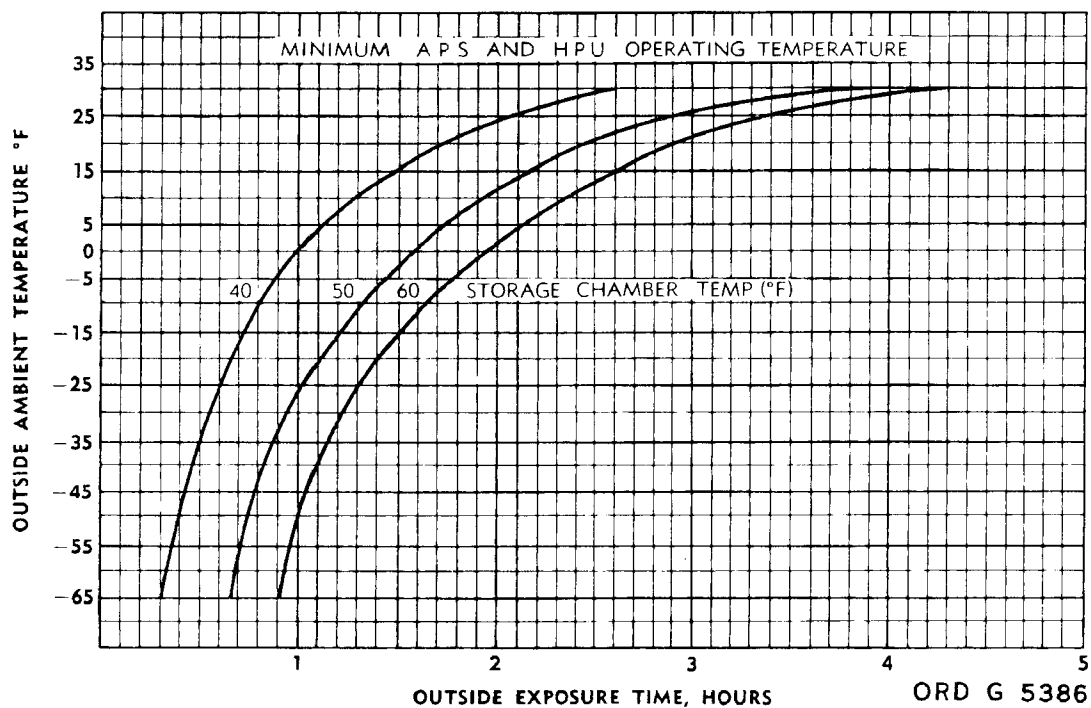


Figure 13-3. Temperature-time graph for the APS and HPU.

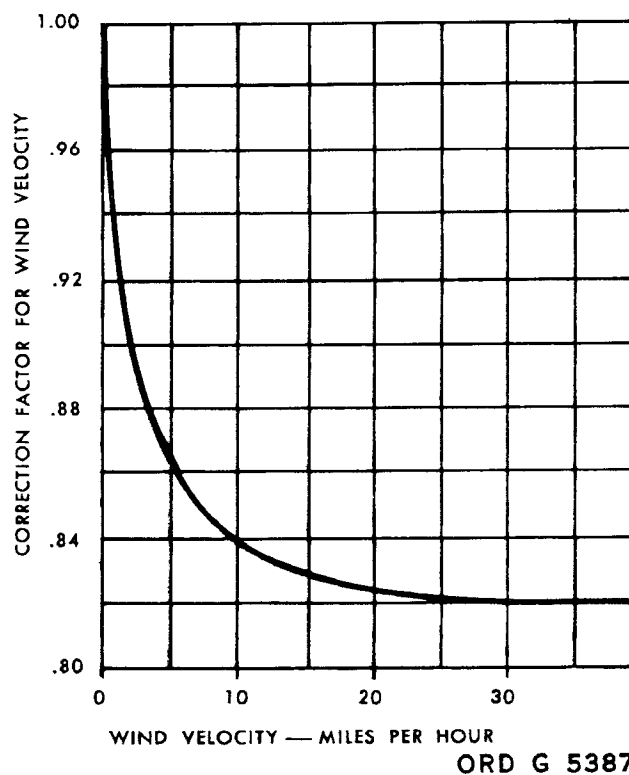


Figure 13-4. Wind velocity correction factor graph for the APS and HPU.

Section II. ROCKET MOTOR CLUSTER WINTERIZATION KIT

13-5. Preparation for Installing the Rocket Motor Cluster Winterization Kit

Note. If guided missile low-bed trailer M529 is to be used for transporting the missile, omit *a* below, and perform *b*.

a. Deactivate the missile and the rocket motor cluster (pars. 11-4 through 11-13).

b. Remove the hexagon-head bolts (1, fig. 8-15) and flat washers (2) that secure the upper rocket motor cluster fin assemblies (3) to the rocket motor cluster; remove the fin assemblies.

c. Remove the side fairing wedges as prescribed below:

(1) Remove the hexagon nuts (3, fig. 8-13), flat washers (2), and hexagon-head bolts (6).

(2) Remove the hexagon-head bolts (7) and flat washers (8).

(3) Remove the side fairing wedges (5).

d. Remove the top and bottom fairing wedges as prescribed below:

(1) Remove the hexagon nuts (1, fig. 8-14), flat washers (2), and hexagon-head bolts (11).

(2) Remove the hexagon-head bolts (4) and flat washers (5) that secure the top fairing wedge (3); remove the fairing wedge.

(3) Remove the hexagon-head bolts (10) and flat washers (9) that secure the bottom fairing wedge (8); remove the fairing wedge.

Note. Side, top, and bottom fairing wedges will not be reinstalled, but should be retained for use if the winterization kit is removed.

e. Remove the four forward nozzle fairings (1, fig. 8-13).

f. Remove the nozzle fairings as prescribed below.

(1) Loosen the fillister-head screws (7, fig. 8-11) that secure the four nozzle fairings together.

Note. Make certain that the filler blocks (1, fig. 8-12) are taped in place before completely removing the assembled nozzle fairings.

(2) Slide the assembled nozzle fairings from the rear of the rocket motor cluster.

13-6. Inspection of the Shipping and Storage Box

a. Inspect the exterior of the shipping and storage box (fig. 13-5) for any damage. Report any damage to the proper authorities.

b. Inspect the lead seals attached to the cover fasteners for evidence of tampering or absence of the seals; report any damage, evidence of tampering or absence of the seal to the proper authorities.

13-7. Uncrating the Rocket Motor Cluster Winterization Kit

a. Break the lead seals (fig. 13-5) located on the cover fasteners.

b. Turn the swivel, and release the hasp from each of the cover fasteners.

Caution: Remove the nails from the straps, and bend the straps backward to prevent damage to the contents of the box during unpacking.

c. Remove the straps from the box cover.

d. Remove the box cover (fig. 13-6).

e. Remove the screws, flat washers, and retainers that secure the four honeycomb fairings; remove the honeycomb fairings.

f. Inspect each honeycomb fairing for external damage.

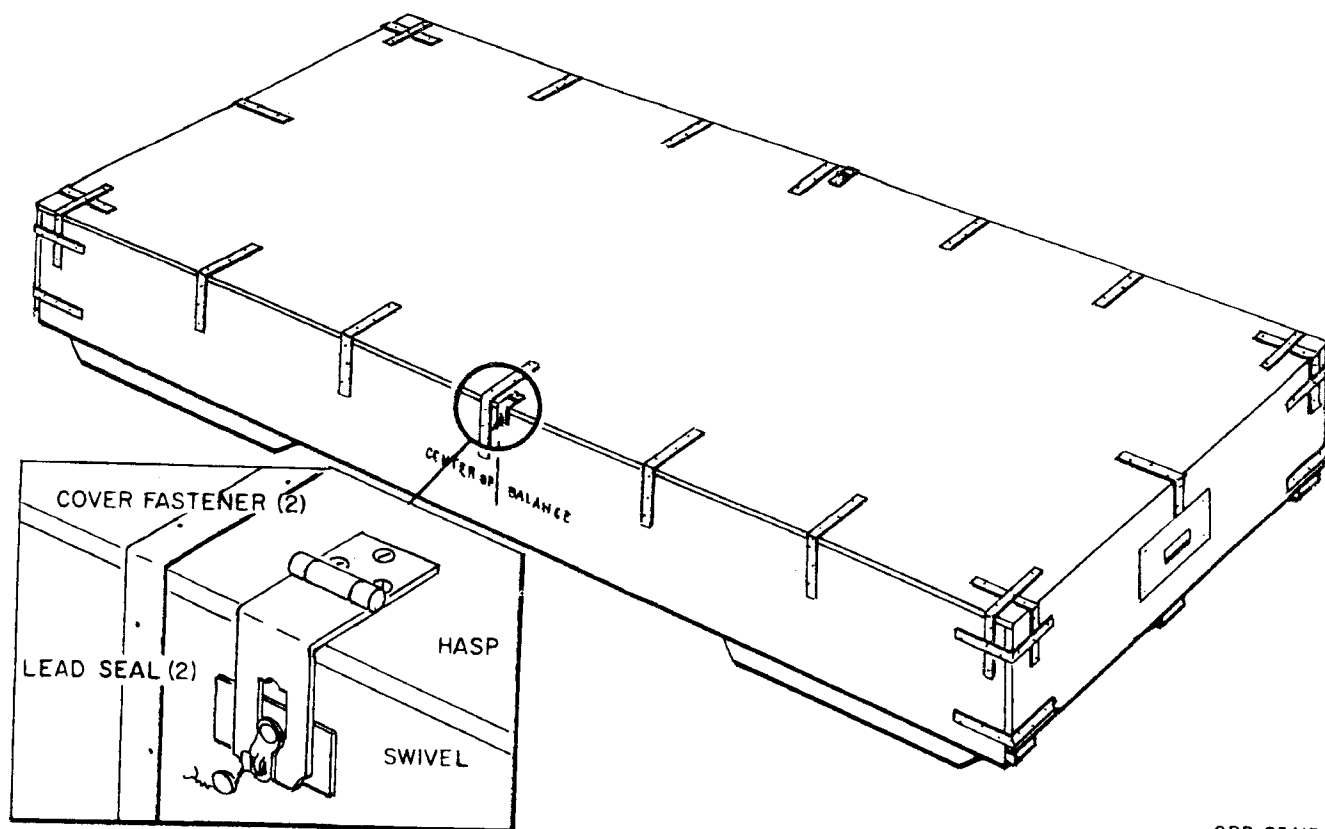
Caution: During unpacking, the heating blankets are to be lifted clear of the shipping and storage box. Do not drag blankets over surfaces that are liable to cause damage.

g. Remove the retainers (fig. 13-7) and the two heating blankets.

h. Repeat *g* above for the two remaining blankets.

i. Inspect each heating blanket for holes, punctures, abraded areas, or damage to the electrical wiring harness and connector.

j. Remove the thermometer assembly carton (fig. 13-8) and the accessory carton.



ORD G5413

Figure 13-5. Inspection and release of the box cover on the shipping and storage box.

Caution Care must be taken to prevent damage to the capillary tubes when performing *k* through *m* below.

k. Open the thermometer assembly carton, and remove the retainer (A, fig. 13-8).

l. Remove the screws, flat washers, and tape that secure the thermometer assembly to the retainer; remove the thermometer assembly.

m. Repeat *l* above for the remaining thermometer assembly.

n. Open the accessory carton (fig. 13-8), and remove the accessories.

o. Inventory all the parts removed from the shipping and storage box against the enclosed packing list.

p. Report any damaged or missing parts to the supervisor.

q. Place all the shipping and storage box hardware inside the shipping and storage box.

r. Close the box cover (fig. 13-5), and secure with the hasps and swivels.

s. Return the shipping and storage box to the storage area.

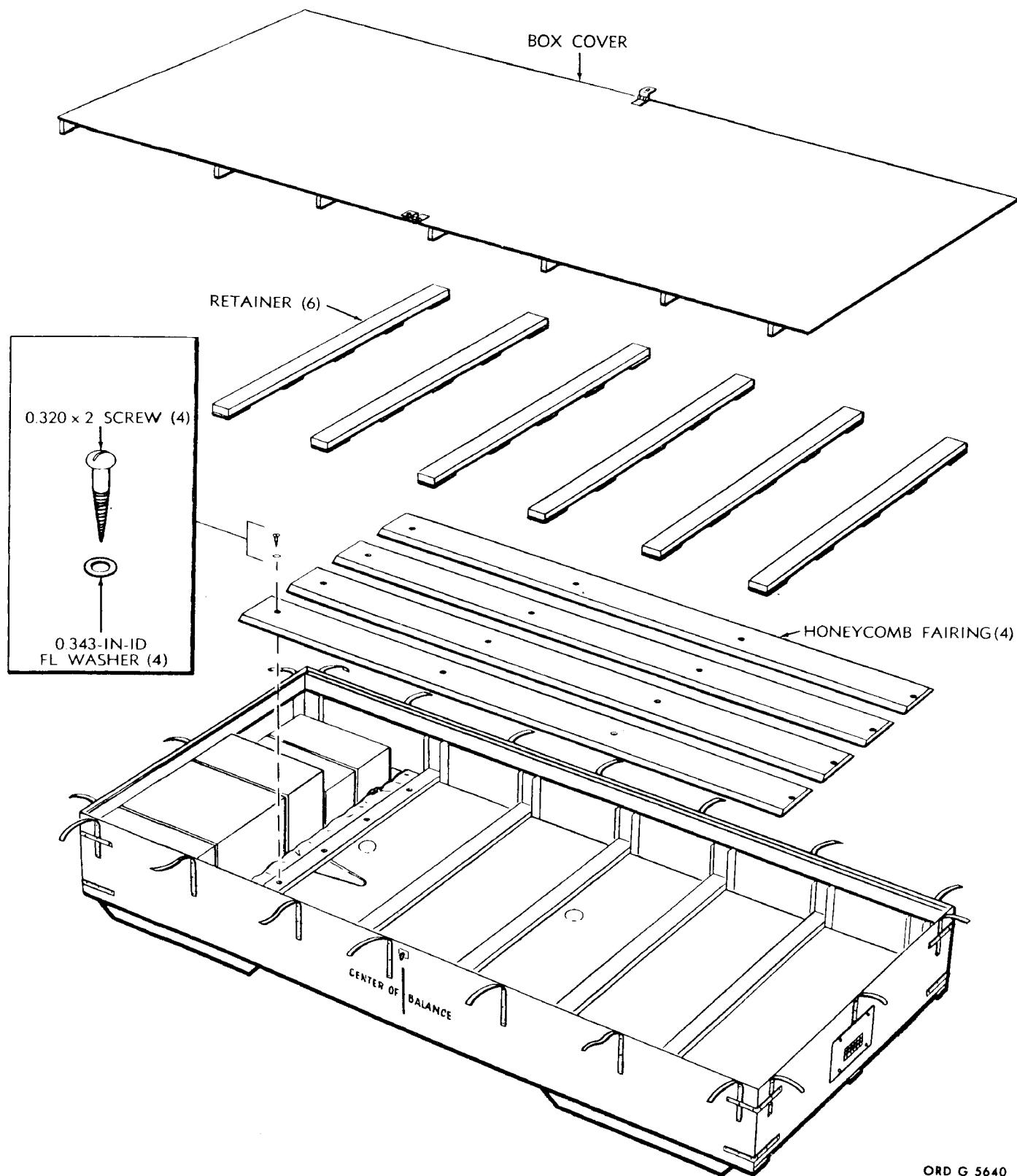
13-8. Installation of Cover Plate

a. Remove the truss-head screws (14 and 20, fig. 8-20), flat washers (15 and 19), and hexagon nuts (16 and 18) that secure the rocket motor igniter cable assembly (12) to the rocket motor thrust ring assembly (1). Discard the screws, but retain the washers and nuts, and leave the clamps (13 and 21) on the igniter cable assembly.

b. Position the cover plate (6, fig. 13-9), with the beveled edges facing to the rear, inside the rocket motor thrust ring assembly (5), and secure the cover plate and the rocket motor igniter cable assembly (4) with the clamps (3), hexagon-head bolts (7), flat washers (1), and hexagon nuts (2).

13-9. Installation of Spring Tension Clips

a. Remove the hexagon-head bolt (2, fig. 13-10), flat washer (4), and hexagon nut (5) from the rocket motor thrust ring assembly (1).



ORD G 5640

Figure 13-6. Removal of the honeycomb fairings.

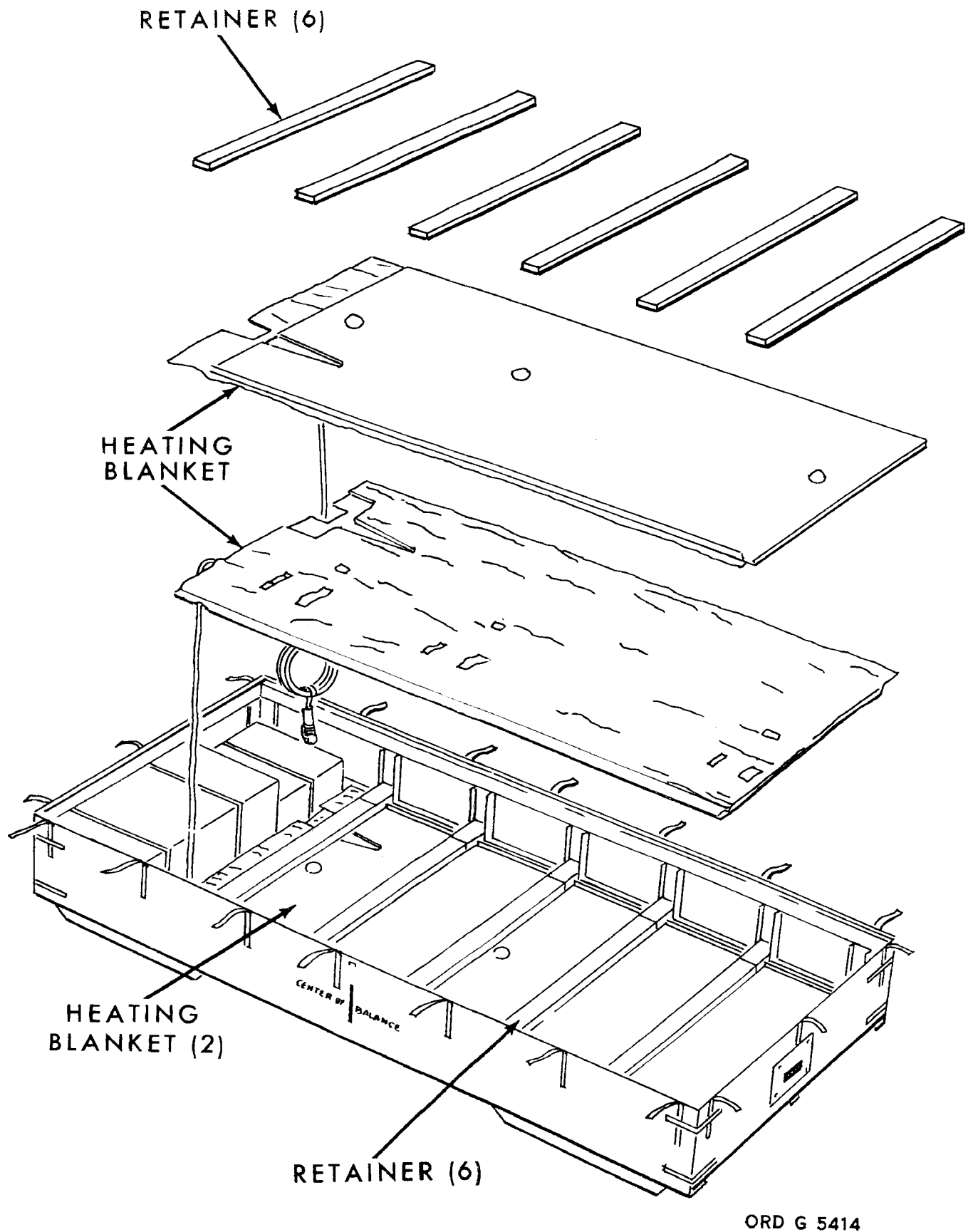


Figure 13-7. Removal of the heating blankets.

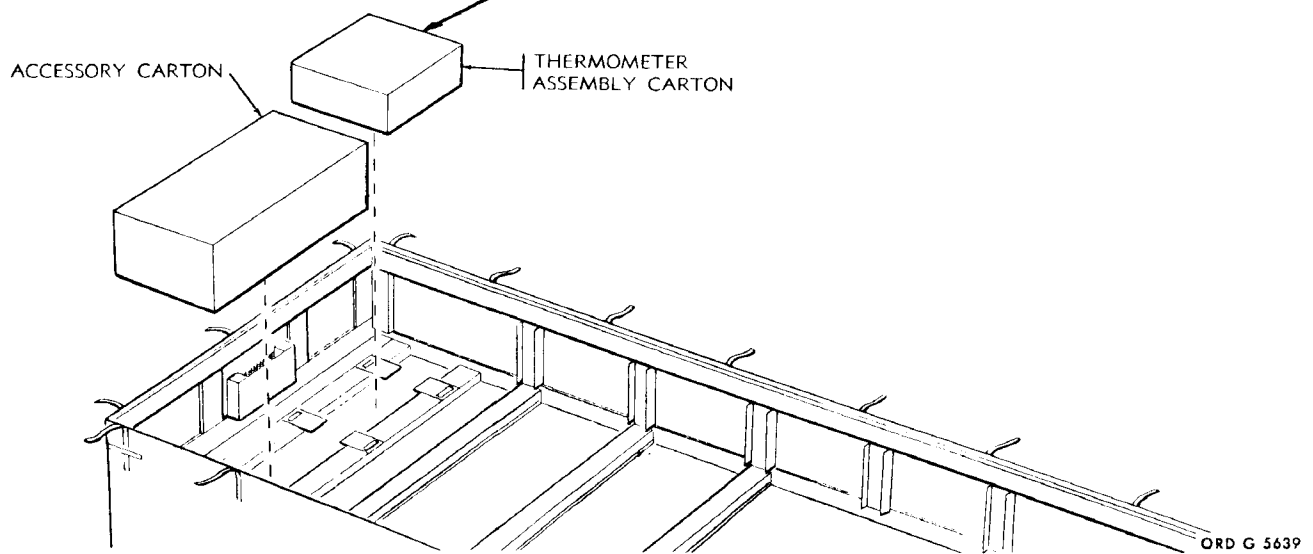
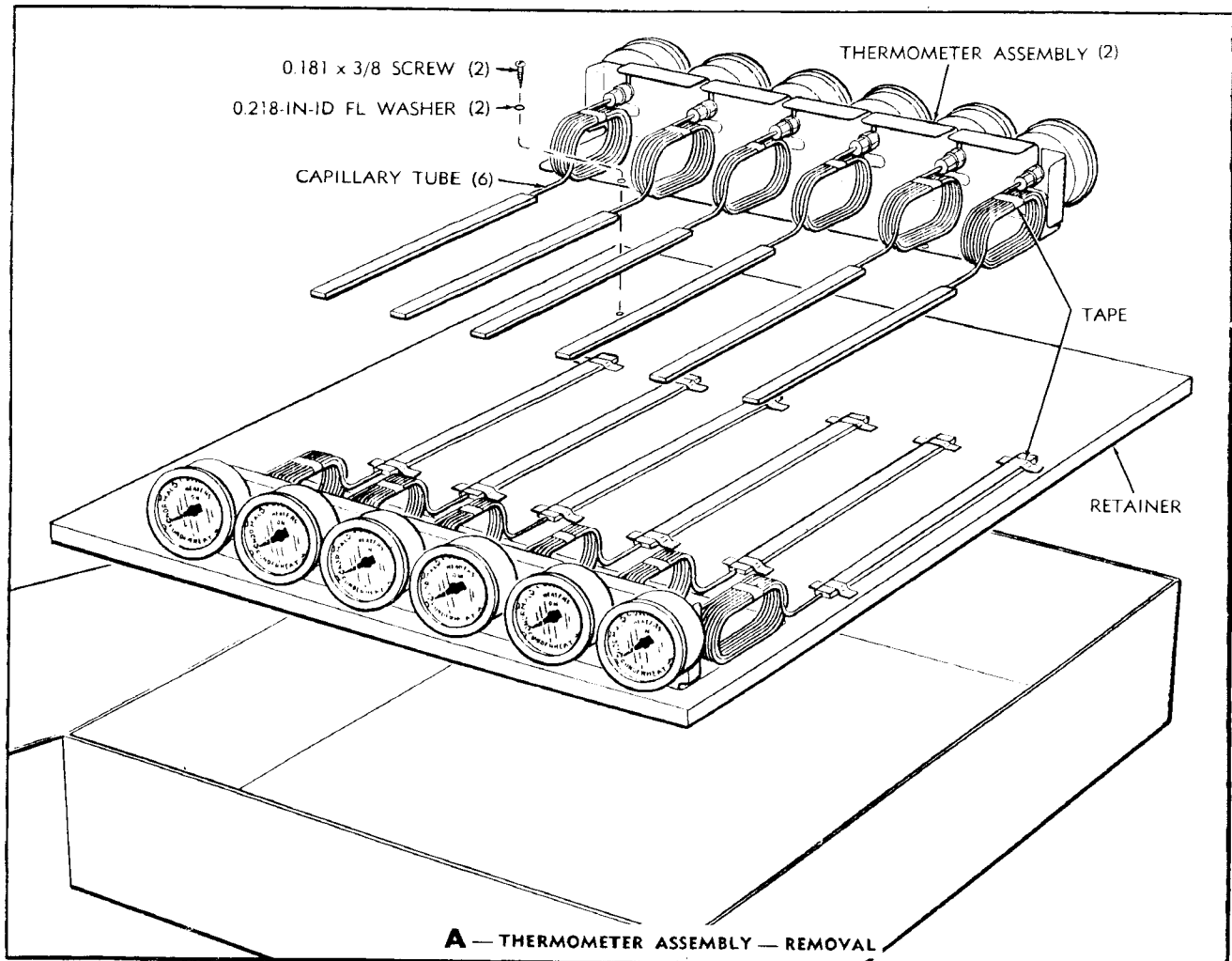
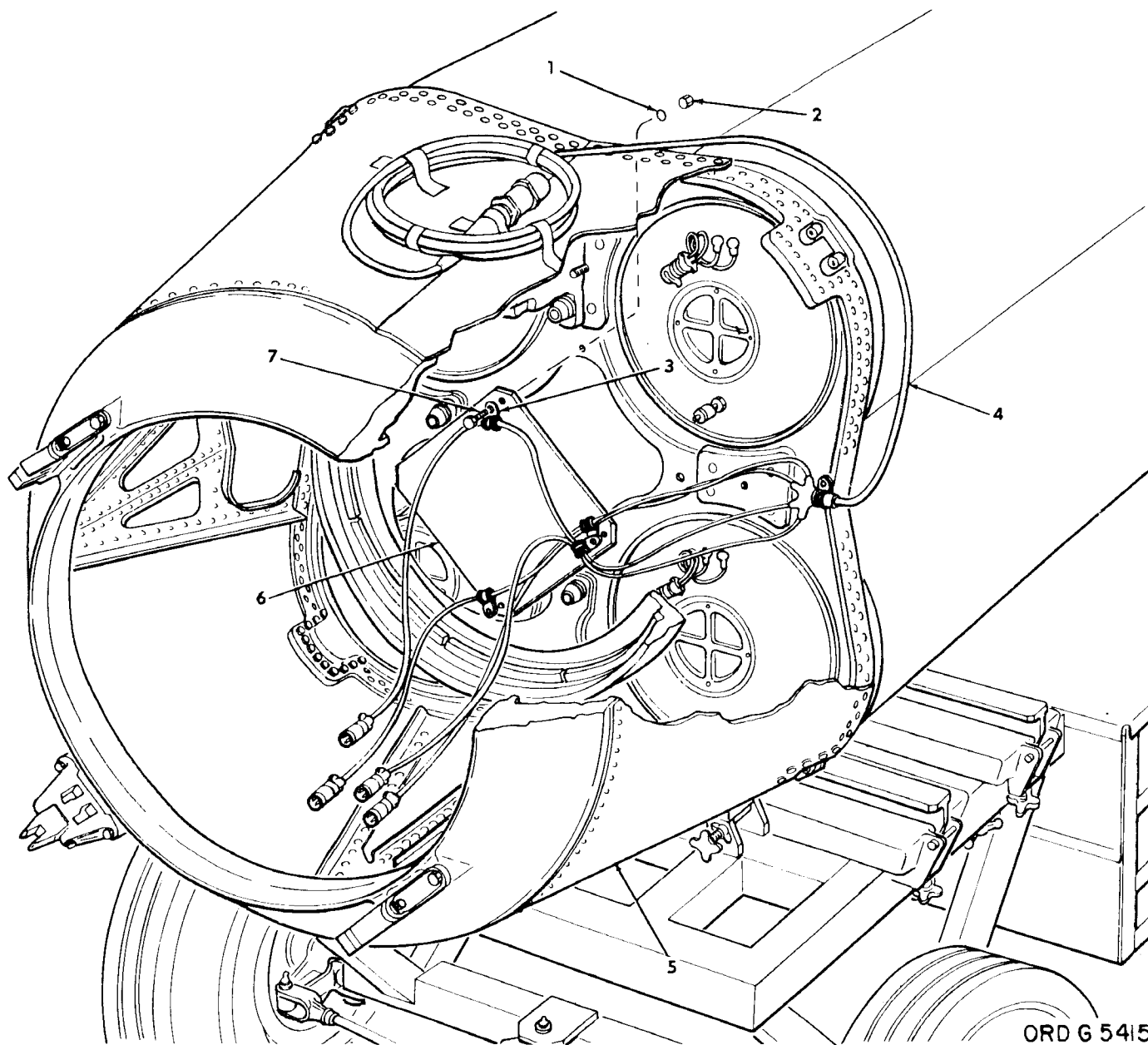


Figure 13-8. Removal of the thermometer assembly cartons.



ORD G 5415

- 1— $\frac{13}{64}$ -in-id fl washer (3)
- 2—No. 10/32 hex. nut (3)
- 3—Clamp (4)
- 4—Rocket motor igniter cable assembly

- 5—Rocket motor thrust ring assembly
- 6—Cover plate
- 7—No. 10-32 x $1\frac{9}{32}$ hex hd-bolt (3)

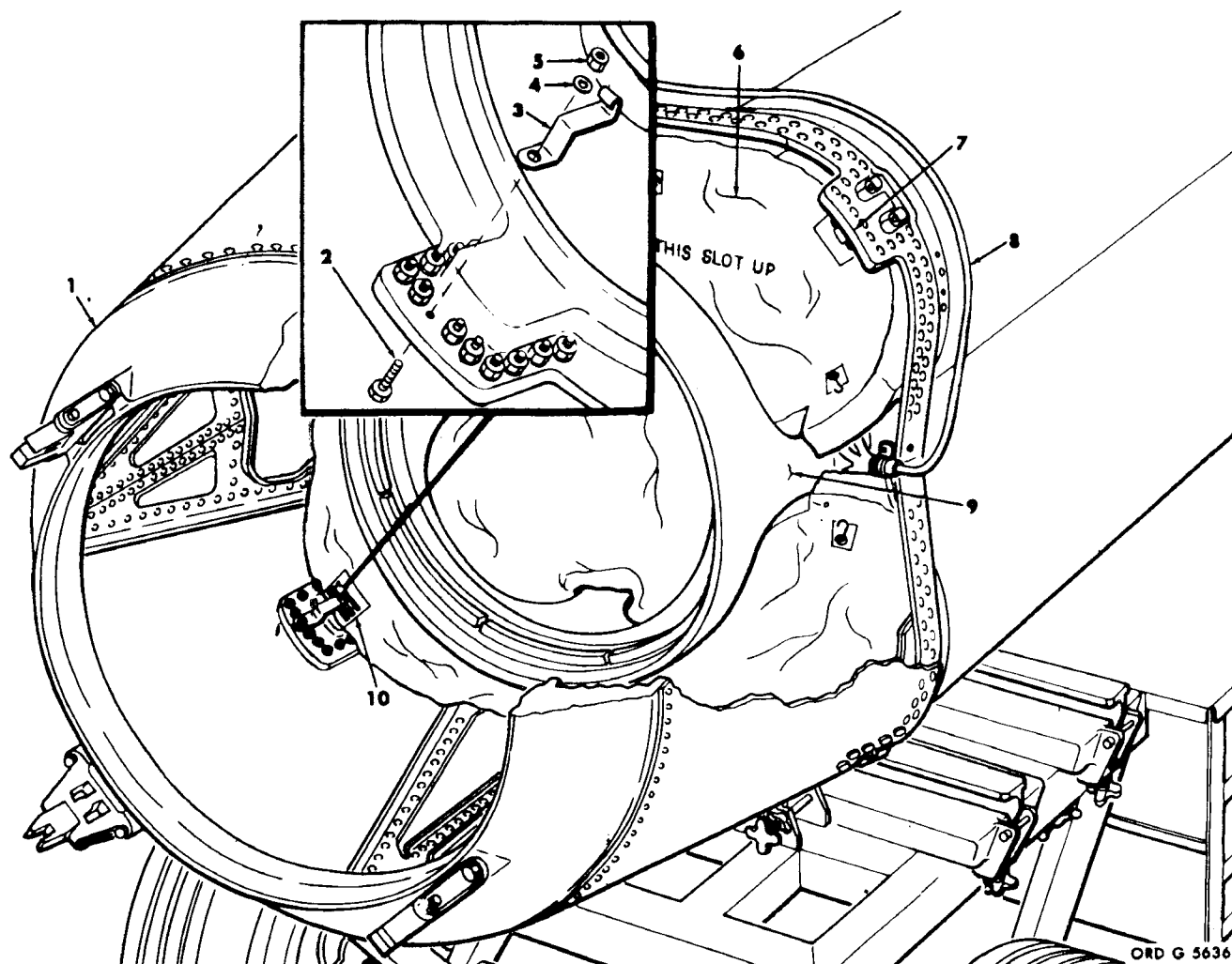
Figure 13-9. Removal and installation of the cover plate.

b. Install the spring tension clip (3), and secure to the rocket motor thrust ring assembly with the hexagon-head bolt, flat washer, and hexagon nut.

c. Repeat a and b above to install the three remaining spring tension clips.

13-10. Installation of Forward Insulation Blanket

a. Insert the forward insulation blanket (6, fig. 13-10) through the forward opening of the rocket motor thrust ring assembly (1) and the pedestal (9).



- 1—Rocket motor thrust ring assembly
- 2—5/16-24 x 27/32 hex-hd bolt (4)
- 3—Spring tension clip (4)
- 4—0.343-in-id fl washer (4)
- 5—5/16-24 hex nut (4)

- 6—Forward insulation blanket
- 7—Base plate
- 8—Rocket motor igniter cable assembly
- 9—Pedestal
- 10—Loop (12)

Figure 13-10. Removal and installation of the spring tension clip and forward insulation blanket.

b. Position the blanket so that the loops (10) are facing forward, and the placard, THIS SLOT UP, is positioned correctly.

c. Fit the slots in the blanket around the legs of the pedestal, and spread the blanket edges to meet the inside surface of the base plate (7).

Note. Do not connect the loops on the blanket to the spring tension clips at this time.

d. Roll up the loose end of the rocket motor igniter cable assembly (8), and securely tape or tie the roll in place on top of the rocket motor thrust ring assembly.

13-11. Installation of Rear Insulation Blanket

a. Position the rear insulation blanket (fig. 13-11) around the nozzle of the rocket motor

with the loop (view A), facing the rear of the nozzle.

b. Fit the rear insulation blanket against the fitting assembly.

c. Insert the clamp (view A) through the slit in the loop, and pull the band through the loop.

d. Position the clamp so that the thumb screw faces inward, and install the band (view B) in the clamp as shown.

e. Repeat *a* through *d* above for the three remaining insulation blankets.

13-12. Installation of the Heating Blankets

Note. Make certain that the correct heating blanket (2 or 12, fig. 13-12) is installed on each rocket motor. Looking from the rear, they are installed on the rocket motors as follows: blankets 9017836 are installed on the upper right and lower left rocket motors; blankets 9017837 are installed on the upper left and lower right rocket motors.

Note. Tie four pieces of cord 6 feet long, at equidistant points in the hook-bolt holes (fig. 13-13) along the flat edge of the heating blanket. The cord will be useful in the final alinement, adjustment, and installation.

Note. When installing the upper heating blankets positioned with the electrical harness and connector to the rear, feed the flat edge of the blanket, with the four lengths of cord inserted, downward between the upper rocket motors. When installing the lower blankets positioned with the electrical harness and connector to the rear, feed the flat edge of the blanket, with the four lengths of cord inserted, upward between the lower rocket motors.

a. Position the heating blanket (2 or 12, fig. 13-12) over the upper rocket motor (13), with the heater cable (9) to the rear.

b. Guide the heater cable through the fitting assemblies (11), and allow the heater cable to hang between the lower nozzles (10).

c. Install the thermometer assembly (7) and the three upper thermometer bulbs (1) as prescribed in steps (1) through (3) below.

(1) Position the thermometer assembly between the upper and lower nozzles; and aline the holes with the holes in the upper and lower fitting assemblies; temporarily secure the thermometer assembly with two hexagon-head bolts (6).

CAUTION: Care must be exercised to prevent crossing the capillary tubes (5) while performing steps (2) and (3) below.

(2) Lift the heating blanket; feed the three thermometer bulbs forward; and thread each bulb through the guides (4).

(3) Position each thermometer bulb in its respective thermometer bulb receiver (3).

d. Install the hook bolts (13, fig. 13-13) through the holes in the flat edge of the blanket from the inner side.

e. Aline the cover collar holes (8) in the heating blanket (6 or 7) with the 1/4-inch holes in the rocket motor (9). Temporarily install two hexagon-head bolts (15, fig. 13-15) and flat washer (14) through the alined holes of each cover so that the cover remains in the proper position.

f. Position the forward edge of the heating blanket two inches from the rocket motor thrust ring assembly (5, fig. 13-13), and insure that all edges are parallel to the rocket motor.

g. Starting at the rear of the blanket, pull the edges together, and start inserting the hook bolts through the holes in the opposite edge of the cover; install the flat washer (15) and hexagon nut (14), and tighten until the next hook bolt projects sufficiently through the hole to install the next flat washer and hexagon nut. Repeat the procedures for all hook bolts, flat washers, and hexagon nuts.

h. Check *e* and *f* above to make certain that the blanket is in the correct position before tightening the attaching hardware.

i. Tighten each hexagon nut a few turns at a time, and work progressively from the rear to the front of the blanket; repeat the procedure until all the hook bolts are secured.

CAUTION: If the blanket cover collar holes are not properly alined, loosen the hook bolts, and aline the heating blanket alinement holes as prescribed in *e* above.

j. Secure the collar (2) by pushing the snaps (1) through the holes and twisting the snaps a quarter-turn in either direction.

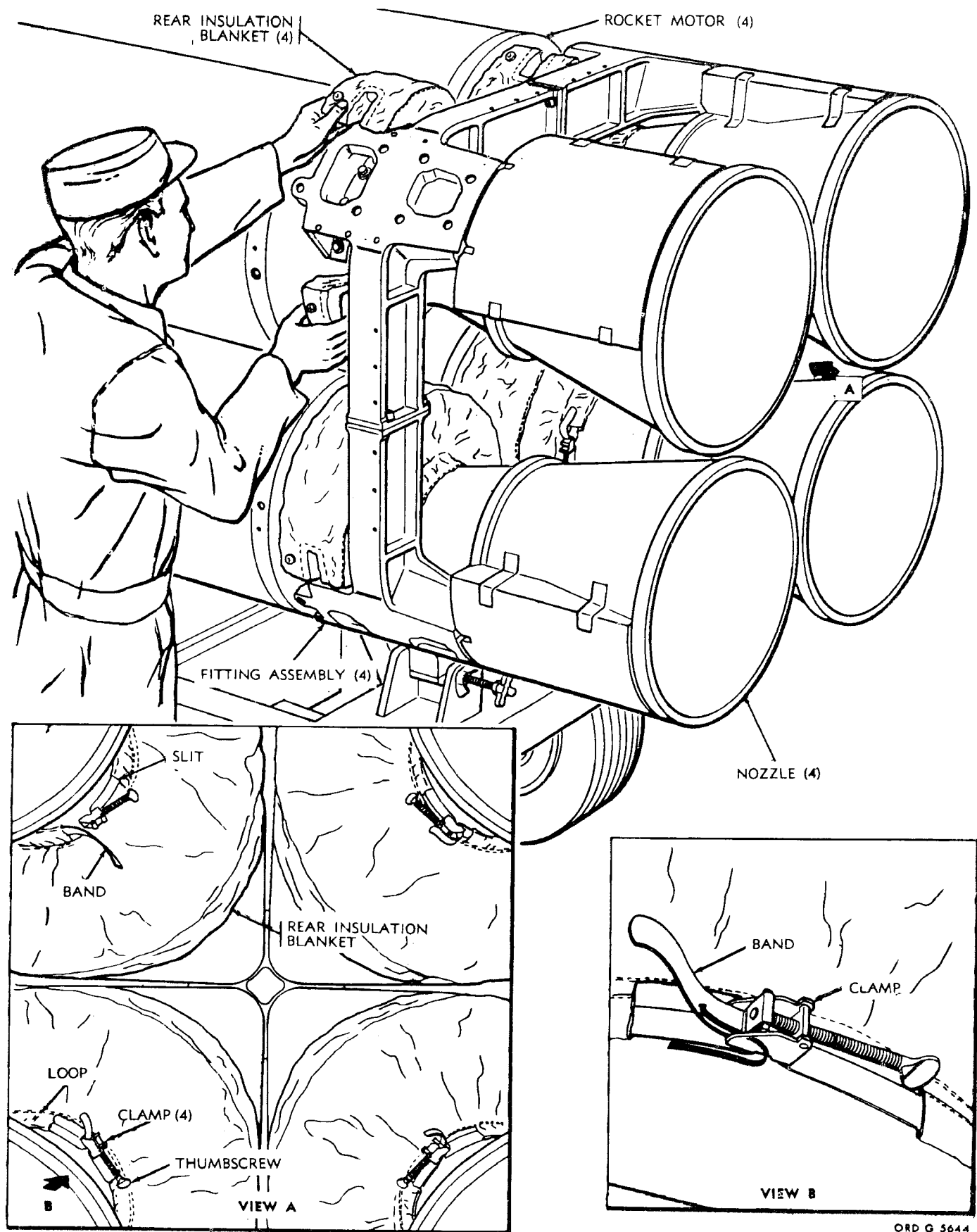
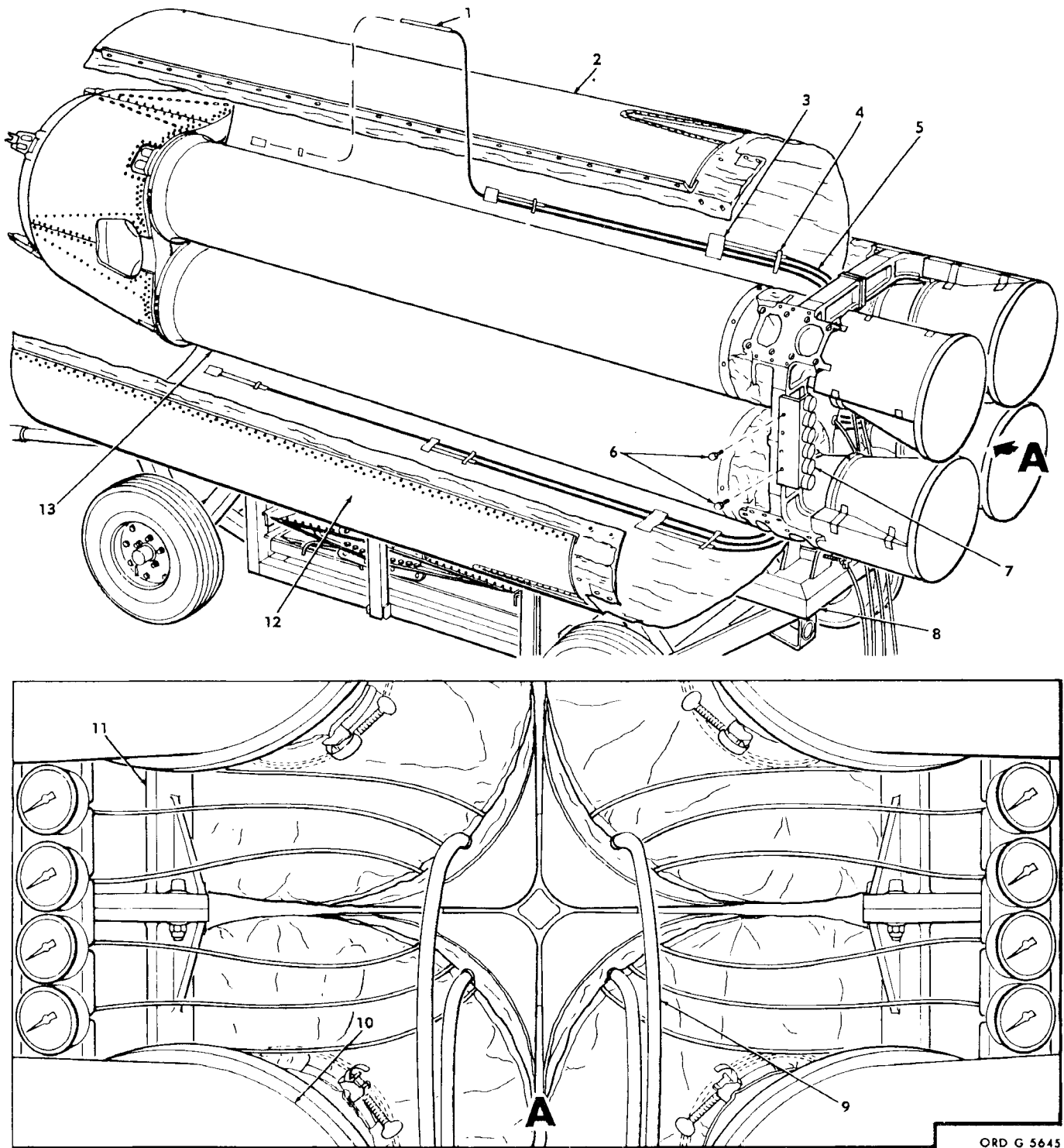


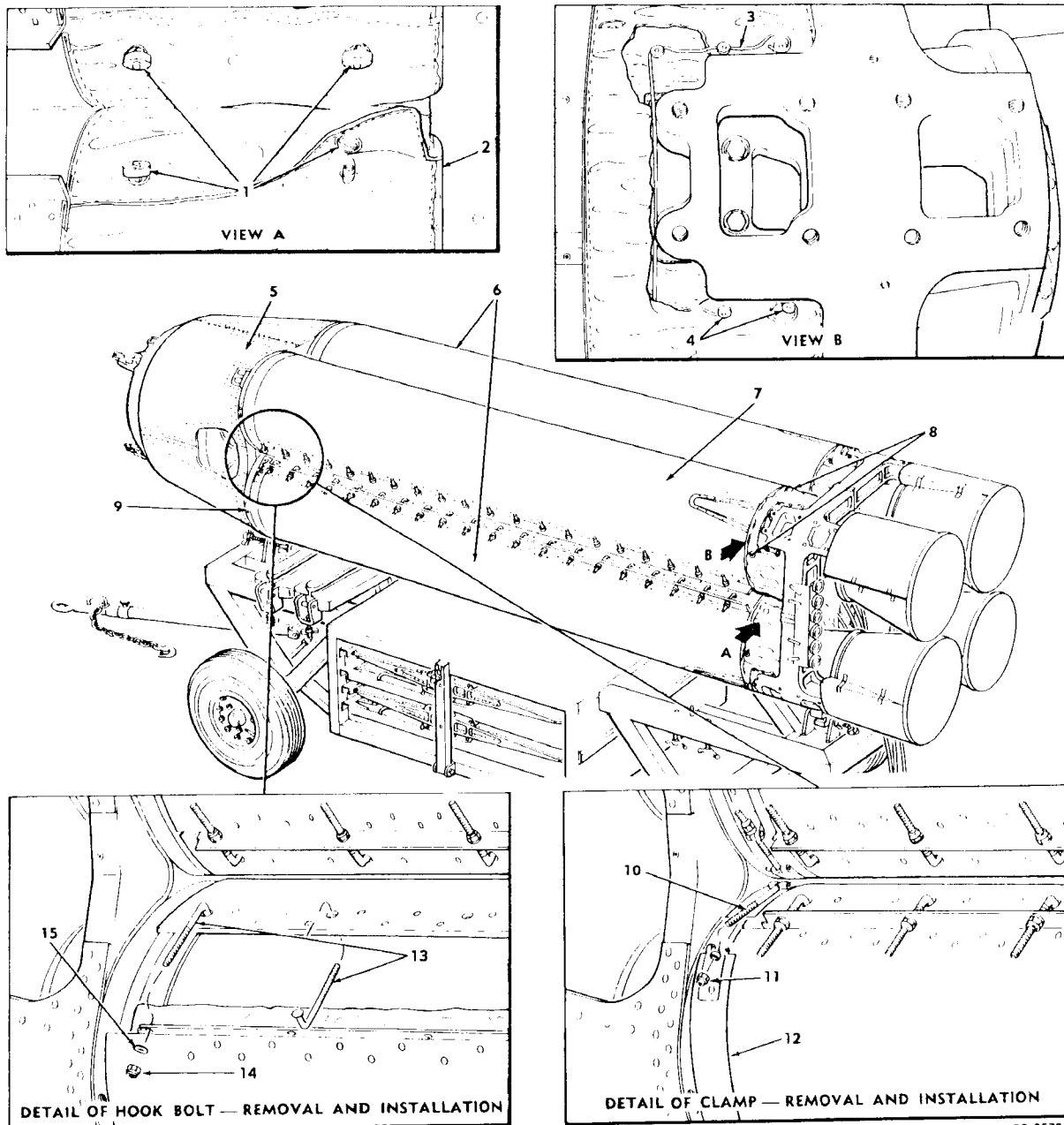
Figure 13-11. Removal and installation of the rear insulation blanket.



ORD G 5645

- | | | |
|----------------------------------|----------------------------------|--------------------------------|
| 1—Thermometer bulb (12) | 6—1/4-28 x 17/32 hex-hd bolt (4) | 11—Fitting assembly (4) |
| 2—Heating blanket 9017837 (2) | 7—Thermometer assy (2) | 12—Heating blanket 9017836 (2) |
| 3—Thermometer bulb receiver (12) | 8—Rocket motor cluster truck | 13—Rocket motor (4) |
| 4—Guide (12) | 9—Heater cable (4) | |
| 5—Capillary tube (12) | 10—Nozzle (4) | |

Figure 13-12. Removal and installation of the heating blankets.



ORD 65396

- 1—Snap
- 2—Collar
- 3—Retaining clip (4)
- 4—Button
- 5—Rocket motor thrust ring assembly
- 6—Heating blanket
- 7—Heating blanket (2)
- 8—Cover collar hole

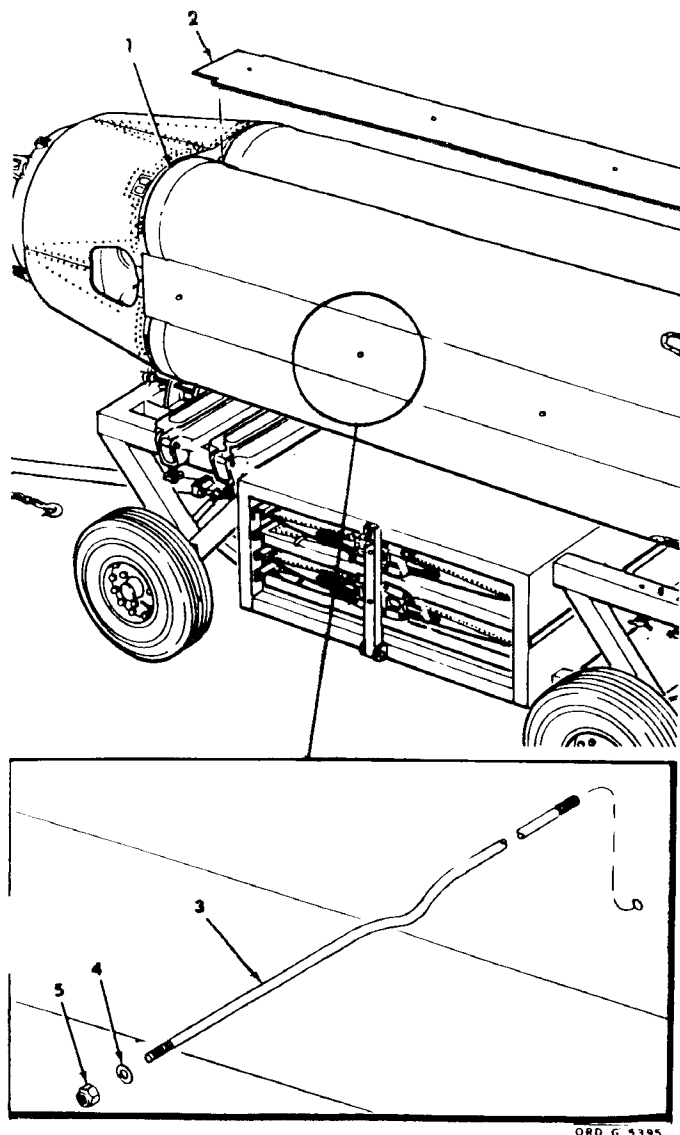
- 9—Rocket motor (4)
- 10—Captive bolt
- 11—5/16-24 self-lkg hex nut
- 12—Clamp 8018829
- 13—Hook bolt 9017823 (20)
- 14—No. 10-32 hex nut (20)
- 15—0.218-in-id fl washer (20)

Figure 13-13. Removal and installation of the heating blankets.

k. Install the retaining clip (3) under the buttons (4).

l. Position the heating blanket (2 or 12, fig.

13-12) for the lower rocket motor (13) on the rocket motor cluster truck (8) with the heater cable (9) to the rear.



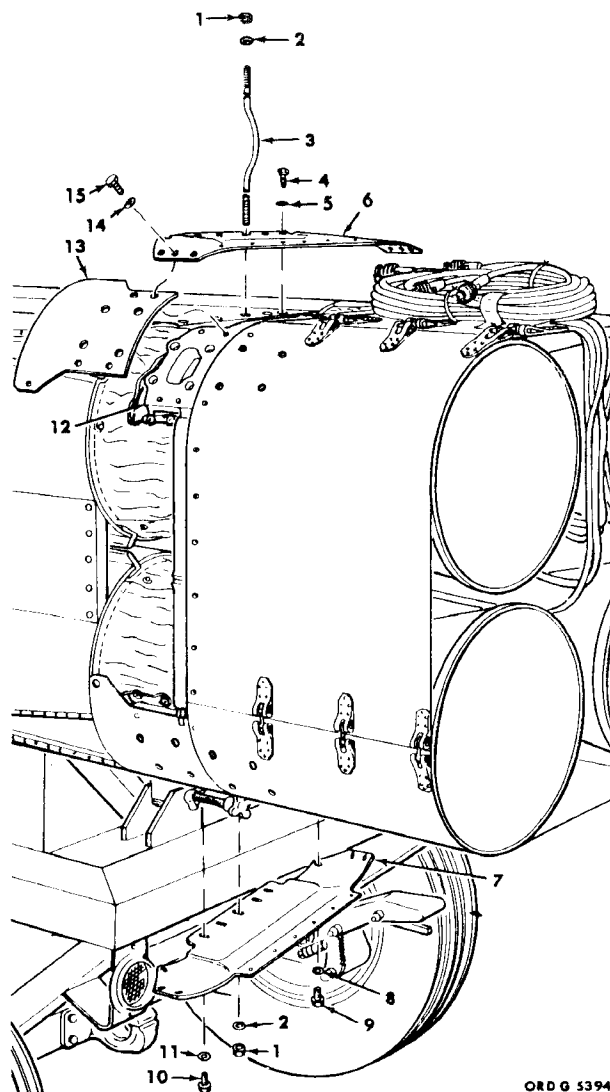
- 1—Heating blanket (4)
- 2—Honeycomb fairing (4)
- 3—Threaded end rod (6)
- 4—0.375-in-id fl washer (12)
- 5—5/16-24 hex. nut (12)

Figure 13-14. Removal and installation of the honeycomb fairing.

m. Guide the heater cable through the fitting assemblies (11), and allow the heater cable to hang between the lower nozzles (10).

CAUTION: Avoid the creation of kinks or pinch points in the capillary tubes (5) during the installation of the thermometer assembly (7) and thermometer bulb (1) while performing n below.

n. Install the lower three thermometer bulbs as prescribed in steps (1) and (2) below:



- 1—5/16 hex. nut
- 2—0.375-in-id fl washer
- 3—Threaded end rod
- 4—No. 10-32 x 17/32 hex-hd bolt (4)
- 5—0.218-in-id fl washer (4)
- 6—Top fairing
- 7—Bottom fairing
- 8—9/32-in-id fl washer (12)
- 9—1/4-28 x 17/32 hex-hd bolt (12)
- 10—No. 10-32 x 17/32 hex-hd bolt (4)
- 11—0.218-in-id fl washer (4)
- 12—Fitting assemblies
- 13—Forward nozzle fairing (4)
- 14—9/32-in-id fl washer (14)
- 15—1/4 x 17/32 hex-hd bolt (4)

Figure 13-15. Removal and installation of the top and bottom fairings.

(1) Feed the three remaining thermometer bulbs forward, and thread each bulb through the guides (4, fig. 13-12).

(2) Position each thermometer bulb in its respective thermometer bulb receiver (3).

CAUTION: The modification (elongation) of the cover collar holes (8, fig. 13-13) is prohibited, as the heating element wires are near the cover collar holes and modification or alteration may result in permanent damage to the heating blanket.

o. Repeat *d* through *k* above for the heating blanket on the lower rocket motor.

p. Remove the bolts and washers installed in *e* above.

q. Repeat *a* through *p* above for the two remaining blankets and the remaining thermometer assembly.

r. Place the clamps (12) around the forward end of the blankets and assemble them with the self-locking hexagon nuts (11).

Note. It may be necessary to put the clamps around the rear end of the blankets and slide them forward.

s. Position the captive bolts (10) parallel to the hook bolts; tighten the self-locking nuts.

13-13. Installation of the Honeycomb Fairings

a. Position the two honeycomb fairings (2, fig. 13-14) between the heating blankets (1), insuring that the forward ends are flush with the rocket motor thrust ring assembly.

b. Insert the threaded end rods (3) through the holes in the honeycomb fairings, and secure the fairing and each threaded end rod with the flat washers (4) and hexagon nuts (5); tighten to the torque value given in table 15-11.

c. Repeat *a* and *b* above for the remaining two honeycomb fairings.

13-14. Installation of the Top and Bottom Fairings

a. Position the four forward nozzle fairings (13, fig. 13-15) over the fitting assemblies (12); aline the holes, and tape in place.

b. Position the top fairing (6), and secure with the flat washers (14) and hexagon-head bolts (15) and flat washers (5), and hexagon-

head bolts (4); tighten to the torque values given in table 15-10.

c. Position the bottom fairing (7), and secure with the flat washers (8), hexagon-head bolts (9), flat washers (11), and hexagon-head bolts (10); tighten to the torque values given in table 15-10.

d. Insert the threaded end rod (3) through the top fairing; pass it through the bottom fairing; and secure it with the flat washers (2) and hexagon nuts (1); tighten to the torque value given in tables 15-10 and 15-11.

13-15. Installation of the Side Fairings

Note. Make certain that the holes in the thermometer assembly are alined with the holes in the fitting assemblies, nozzle fairings, and side fairings.

a. Remove the hexagon-head bolts (6, fig. 13-12) temporarily securing the thermometer assemblies (7), and support the thermometer assemblies until they are secured by the side fairings (5, fig. 13-16).

b. Position the side fairings, and secure each with the flat washer (2), hexagon-head bolts (1), flat washers (6), and hexagon-head bolts (7); tighten to the torque values given in table 15-10.

c. Install the threaded end rod (8), and secure with the flat washers (3) and hexagon nuts (4); tighten to the torque value given in table 15-10 and 15-11.

d. Position the two rocket motor cluster fin assemblies (fig. 8-15), and secure with the 16 hexagon-head bolts and flat washers.

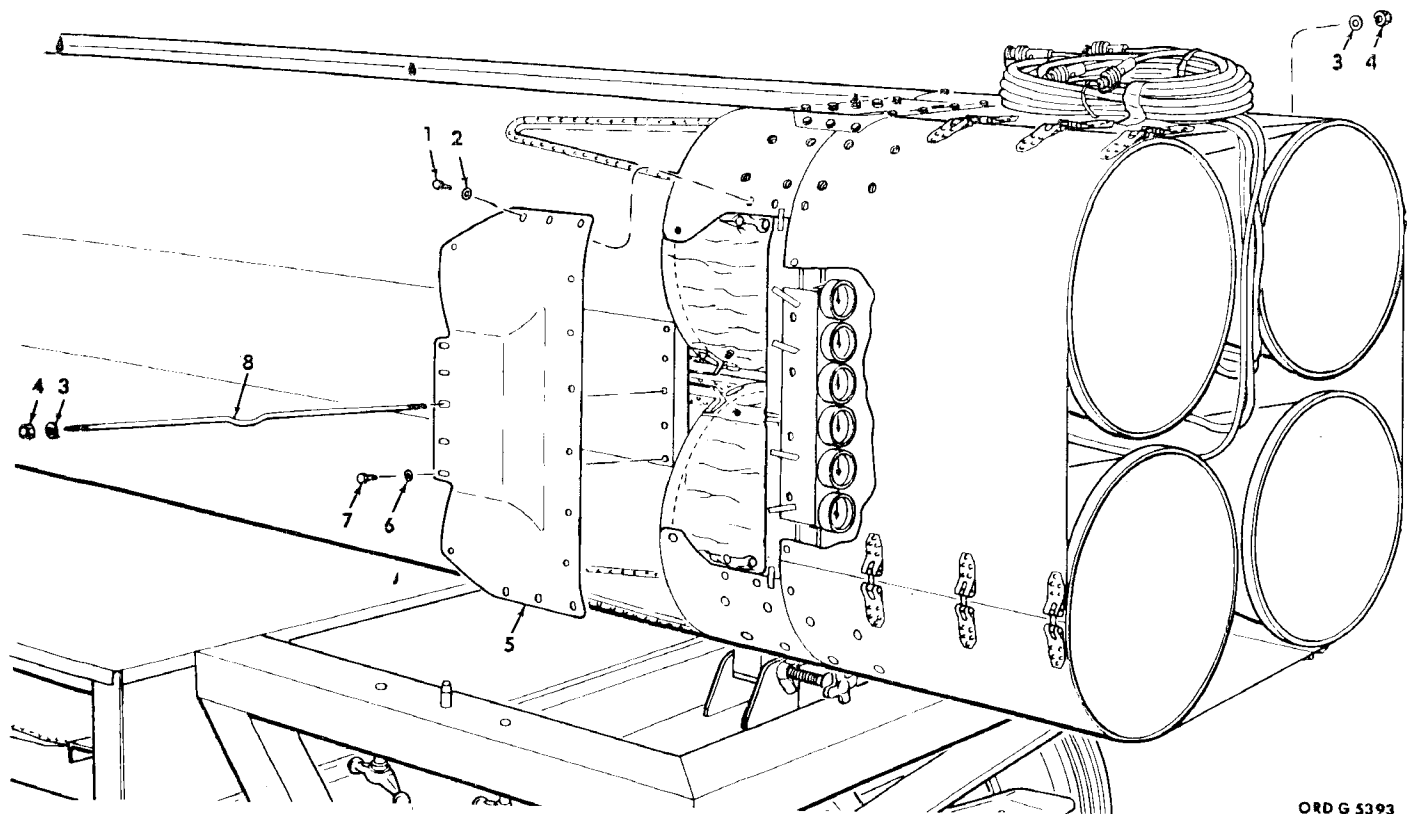
13-16. Joining Procedures and Final Installation

a. Perform the joining procedures for the missile body and the rocket motor cluster (chapter 9).

b. Perform the final preparation of the missile (chapter 10).

c. Secure the loops (3, fig. 13-17) on the forward insulation blanket (4) to the spring tension clips (2). Select the proper loop so that the blanket fits snugly around the inside of the rocket motor thrust ring assembly (1).

d. Attach each spring (5) to the hook (6) on the forward insulation blanket; stretch to the opposite hook; and secure in place.



ORD G 5393

- 1—1/4-28 x 17/32 hex-hd bolt (14)
- 2—9°32-in-id fl washer (14)
- 3—0.375-in-id fl washer
- 4—5/16 hex. nut

- 5—Side fairing (2)
- 6—0.218-in-id fl washer (4)
- 7—No. 10-32 x 17°32 hex-head bolt (4)
- 8—Threaded end rod

Figure 13-16. Removal and installation of the side fairings.

13-17. Installation of the Heater Cable Shearing Clamp

a. Weave the heater cables (7, fig. 13-18) through the slots (5) in each side of the heater cable shearing clamp (6) (two cables on each side) so that all the cables go in and come out one end.

b. Secure the shearing clamp to the rail with the hexagon head bolts (4), lockwashers (3), and hexagon nuts (2). Tighten the bolts to the torque value given in table 15-11.

c. Connect the four heater connectors (fig. 13-19) to connectors J115-1, J115-2, J115-3, and J115-4 on the distribution box mounted on the launcher.

13-18. Preparation for Removal of the Rocket Motor Cluster Winterization Kit

a. Disconnect the four heater connectors (fig.

13-19) from connectors J115-1, J115-2, J115-3, and J115-4 on the distribution box on the launcher.

b. Remove the hexagon nuts (2, fig. 13-18), lockwashers (3), and hexagon-head bolts (4) that secure the heater cable shearing clamp (6) to the underside of the launching-handling rail (1); remove the shearing clamp.

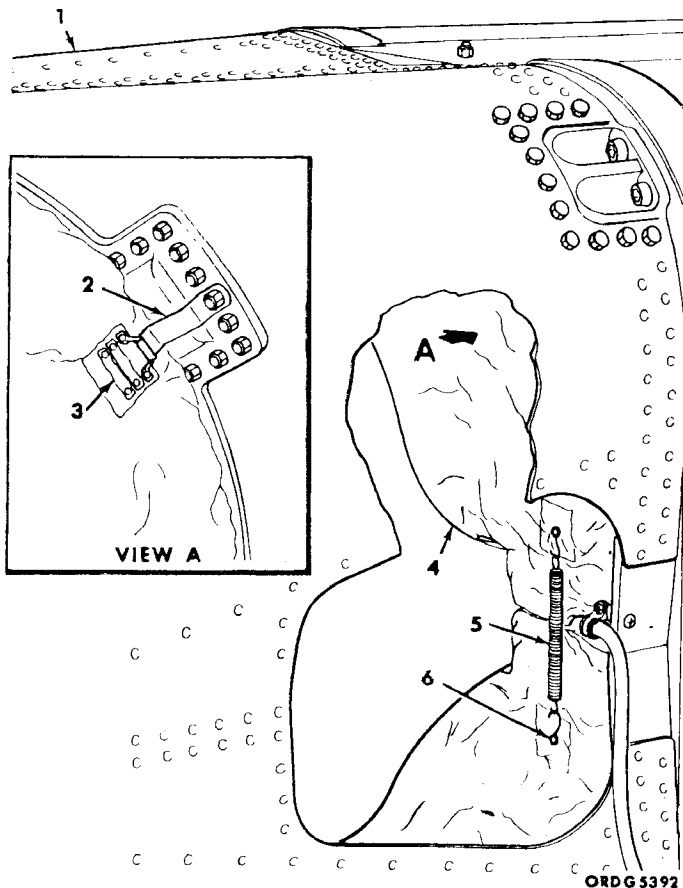
c. Remove the heater cables (7) from the slots (5) in the shearing clamp.

d. Remove the four springs (5, fig. 13-17) from the eight hooks (6) on the forward insulation blanket (4).

e. Disconnect the four spring tension clips (2) from the four loops (3).

f. Fold the forward insulation blanket forward, and tape in place.

Note. If guided missile low-bed trailer M529 is to be used to transport the missile, omit *g* below, and perform *h* through *j* below.



- 1—Rocket motor thrust ring assembly
- 2—Spring tension clip (4)
- 3—Loop (12)
- 4—Forward insulation blanket
- 5—Spring (4)
- 6—Hook (8)

Figure 13-17. Final Preparation of the forward insulation blanket.

g. Deactivate the missile and the rocket motor cluster (pars. 11-4 through 11-13).

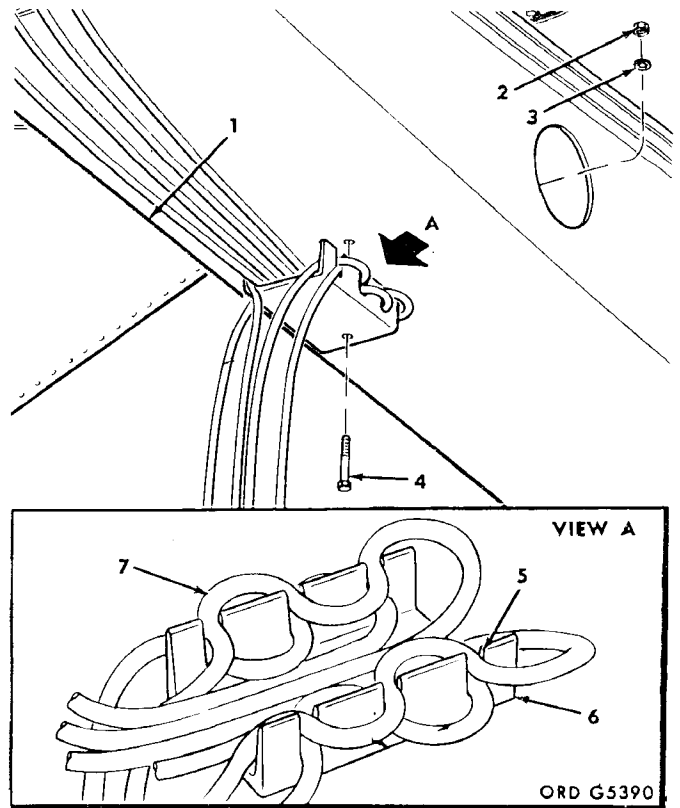
h. Deactivate the missile and the rocket motor cluster (pars. 11-4, 11-5, 11-6a, b, and e and 11-7a and b).

i. Disconnect the rocket motor heater cables from the J10 connectors on guided missile low-bed trailer M529 as prescribed in TM 9-2330-255-14.

j. Deactivate the missile and the rocket motor cluster (pars. 11-10 through 11-13a (3)).

13-19. Removal of the Rocket Motor Cluster Winterization Kit

a. Remove the rocket motor cluster fin assemblies (par. 12-102).



- 1—Launching-handling rail
- 2—1/2-20 hex. nut (2)
- 3—0.509-in-id lockwasher (2)
- 4—1/2-20 x 2-1/4 hex-hd bolt (2)
- 5—Slot
- 6—Heater cable shearing clamp
- 7—Heater cables

Figure 13-18. Removal and installation of the heater cable shearing clamp.

b. Remove the hexagon nuts (4, fig. 13-16) and flat washers (3) that secure the threaded end rod (8); remove the rod.

Note. Support the thermometer assemblies when removing the side fairings (5).

c. Remove the hexagon-head bolts (1 and 7) and flat washers (2 and 6) that secure each side fairing; remove the fairings.

d. Temporarily secure each thermometer assembly (7, fig. 13-12) with two hexagon-head bolts (6).

e. Remove the hexagon nuts (1, fig. 13-15) and flat washers (2) that secure the threaded end rod (3); remove the rod.

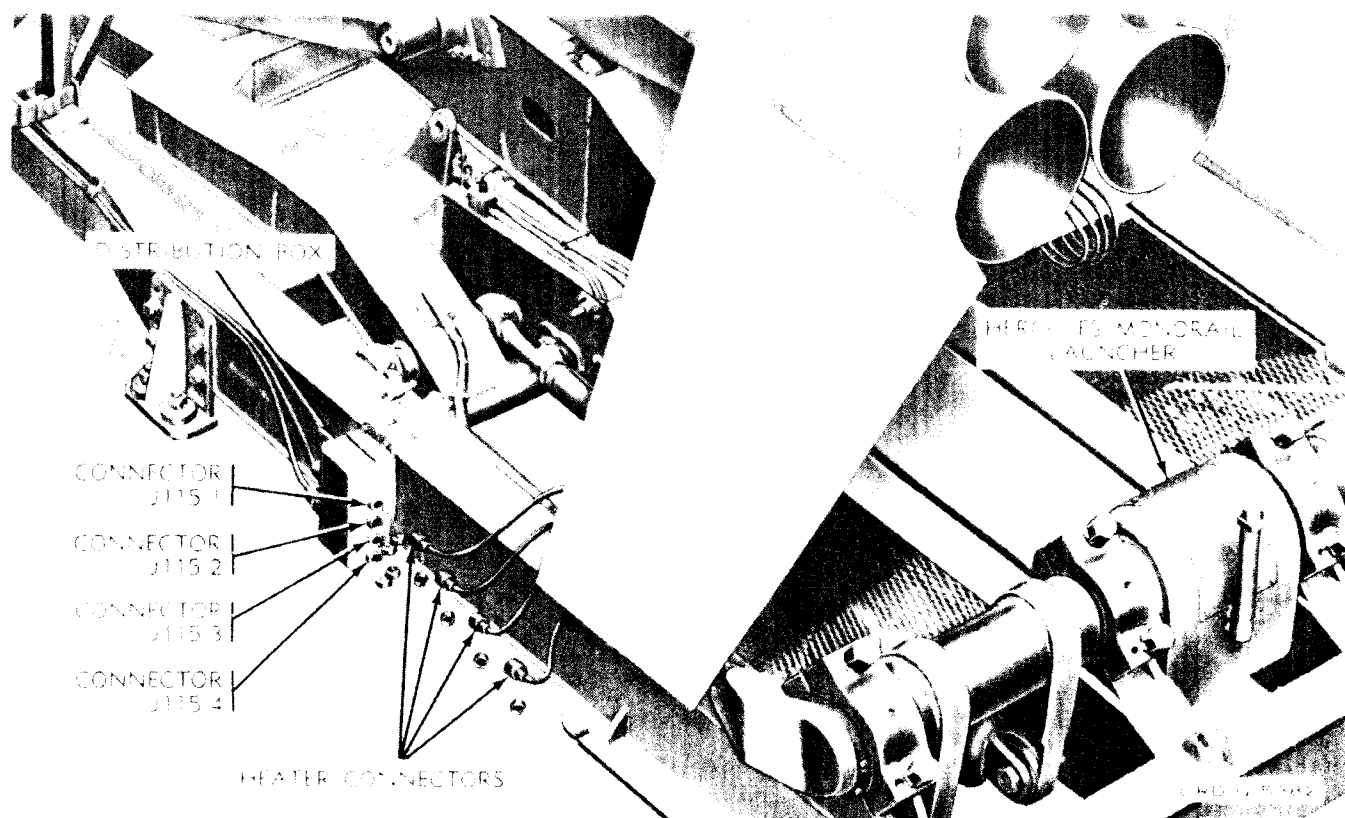


Figure 13-19. Disconnection and connection of the heater cables.

f. Remove the hexagon-head bolts (4 and 15) and flat washers (5 and 14) that secure the top fairing (6); remove the fairing.

g. Remove the hexagon-head bolts (9 and 10) and flat washers (8 and 11) that secure the bottom fairing (7); remove the fairing.

h. Remove the forward nozzle fairings (13).

i. Remove the hexagon nuts (5, fig. 13-14) and flat washers (4) that secure the three threaded end rods (3) and two honeycomb fairings (2); remove the rods and fairings.

j. Repeat *i* above for the three remaining threaded end rods and the two remaining honeycomb fairings.

k. Twist the snaps (1, fig. 13-13 in either direction and release them.

l. Remove the retaining clips (3) that secure the collars (2).

m. Remove the self-locking hexagon nut (11) that secures the clamp (12); remove the clamp.

n. Repeat *m* above for the three remaining clamps.

o. Remove the hexagon nuts (14) and flat washers (15) that secure the hook bolts (13) to the lower heating blanket (6 or 7); remove the hook bolts.

p. Repeat *o* above for the upper heating blanket.

CAUTION: Care must be exercised to prevent damage to the capillary tubes (5, fig. 13-12) when the thermometer bulbs (1) are being removed.

q. Slide the thermometer bulbs from the thermometer bulb receivers (3) and guides (4) on each heating blanket (2 and 12).

r. Remove the hexagon-head bolts (6) that secure the thermometer assembly (7) between the nozzles (10); remove the thermometer assembly.

s. Remove the upper and lower heating blankets.

t. Repeat *o* through *s* above for the two remaining heating blankets and the thermometer assembly.

u. Remove the four clamps (view A, fig. 13-11) that secure the rear insulation blankets; remove the blankets.

v. Pass the forward insulation blanket (6, fig. 13-10) through the forward opening in the pedestal (9); remove the blanket.

w. Remove the hexagon nut (5), flat washer (4), and hexagon-head bolt (2) that secure the spring tension clip (3); remove the clip.

x. Repeat *x* above for the three remaining spring tension clips.

y. Reinstall the hexagon nuts, flat washers, and hexagon-head bolts on the rocket motor thrust ring assembly (1).

z. Remove the hexagon nuts (2, fig. 13-9), flat washers (1), and hexagon-head bolts (7) that secure the rocket motor igniter cable assembly (4) and cover plate (6) to the rocket motor thrust ring assembly (5); remove the plate.

aa. Reinstall the rocket motor igniter cable assembly (par. 8-9).

ab. Assemble the rocket motor cluster (par. 8-6 *ad* through *ak*).

ac. Perform the joining and final preparation procedures (chapters 9 and 10).

13-20. Packaging the Rocket Motor Cluster Winterization Kit

a. Position the thermometer assembly (A, fig. 13-8) in the thermometer assembly carton,

and secure to the retainer with the screws and flat washers; secure the capillary tubes with tape.

b. Repeat *a* above for the remaining thermometer assembly.

c. Position the accessories in the accessory carton (fig. 13-8).

d. Position the thermometer assembly carton and the accessory carton in the shipping and storage box, and secure in place.

e. Position two heating blankets (fig. 13-7) in the shipping and storage box, and position six retainers over the covers.

f. Position the two remaining heating blankets over the retainers, and position six retainers over the covers.

g. Position the four honeycomb fairings (fig. 13-6) in the shipping and storage box, and secure with the screws and flat washers; position the six retainers over the fairings.

h. Position the box cover over the shipping and storage box, and position the hasp (fig. 13-5) on each of the cover fasteners.

i. Position the straps, and secure to the cover with nails.

j. Turn the swivels on each of the cover fasteners, and seal with lead seals.

k. Process the shipping and storage box for shipment or storage.

SECTION III. APS AND BATTERY BOX WINTERIZATION KIT

13-21. Installation of the APS Winterization Kit

a. Remove the APS from the equipment section (par. 12-69*a*).

b. Insert the APS heating blanket (4, fig. 13-20) into the equipment section (1).

c. Connect connector P520 (2) to connector J520 (3).

d. Remove the protective cloth (fig. 13-21) from the tape on the edges of the blanket.

e. Aline the holes in the blanket with the holes in the structure, and secure the blanket in place by pressing the tape around the edges of the opening.

f. Position the regulating thermostat bracket so that it hangs outside the equipment section, and tape to the rear main fin.

g. Install the APS (par. 12-69*b*).

h. Remove the roundhead screws (4, fig. 13-22) and flat washers (3) from the control assembly (1).

m. Perform air and oil servicing of the APS as prescribed in chapter 4.

13-22. Installation of the Missile Battery Box Blanket

a. Check that the shorting connector (d, fig. 10-9) is installed on rocket motor igniter cable assembly connector P109A.

b. Remove the two safety-and-arming devices (11-4a through c).

c. Remove the flathead screws (2, fig. 11-1), and remove the IGNITOR access cover plate (3).

d. Depress the PUSH TO RESET switch (fig. 5-13) on safety-and-arming switch S31, located above the IGNITOR access cover plate. Check that the green field is visible through the inspection window (view A, fig. 5-13) of S31.

e. Remove the equipment section access cover plate from the left side of the missile.

f. Disconnect connector J510 on the battery wiring harness from connector P510 on the missile distribution box.

g. Remove the truss-head screw, flat washers, and lockwashers that secure the loop clamp to the missile structure; remove the clamp from the structure.

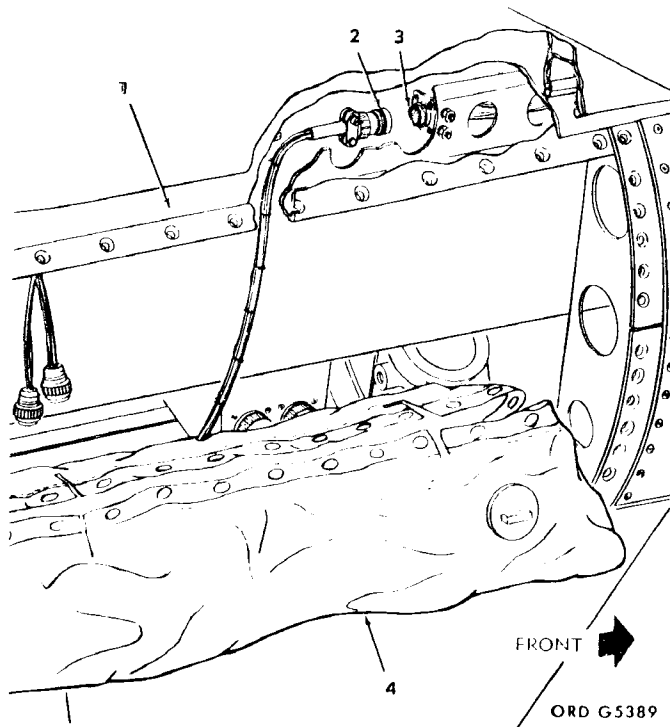
h. Slip the battery box insulation blanket (2, fig. 13-23) over the missile battery box (4) so that the bottom drawstring (3) and the inclined side of the top are facing the missile distribution box (5). While fitting the blanket over the missile battery box, guide the battery wiring harness (1) through the top opening in the blanket.

i. Connect connector J510 on the battery wiring harness (1) to connector P510 on the missile distribution box (5).

j. Secure the loop clamp to the missile structure with the truss-head screw, flat washers, and lockwasher.

k. Tighten and secure the drawstrings (3, fig. 13-23) around the top and bottom of the blanket.

l. Install the flathead screws (2, fig. 11-1) to secure the IGNITER access cover plate (3) to the rear body section (1).



- 1—Equipment section
- 2—Connector P520
- 3—Connector J520
- 4—APS heating blanket

Figure 13-20. Disconnection and connection of the APS heating blanket power.

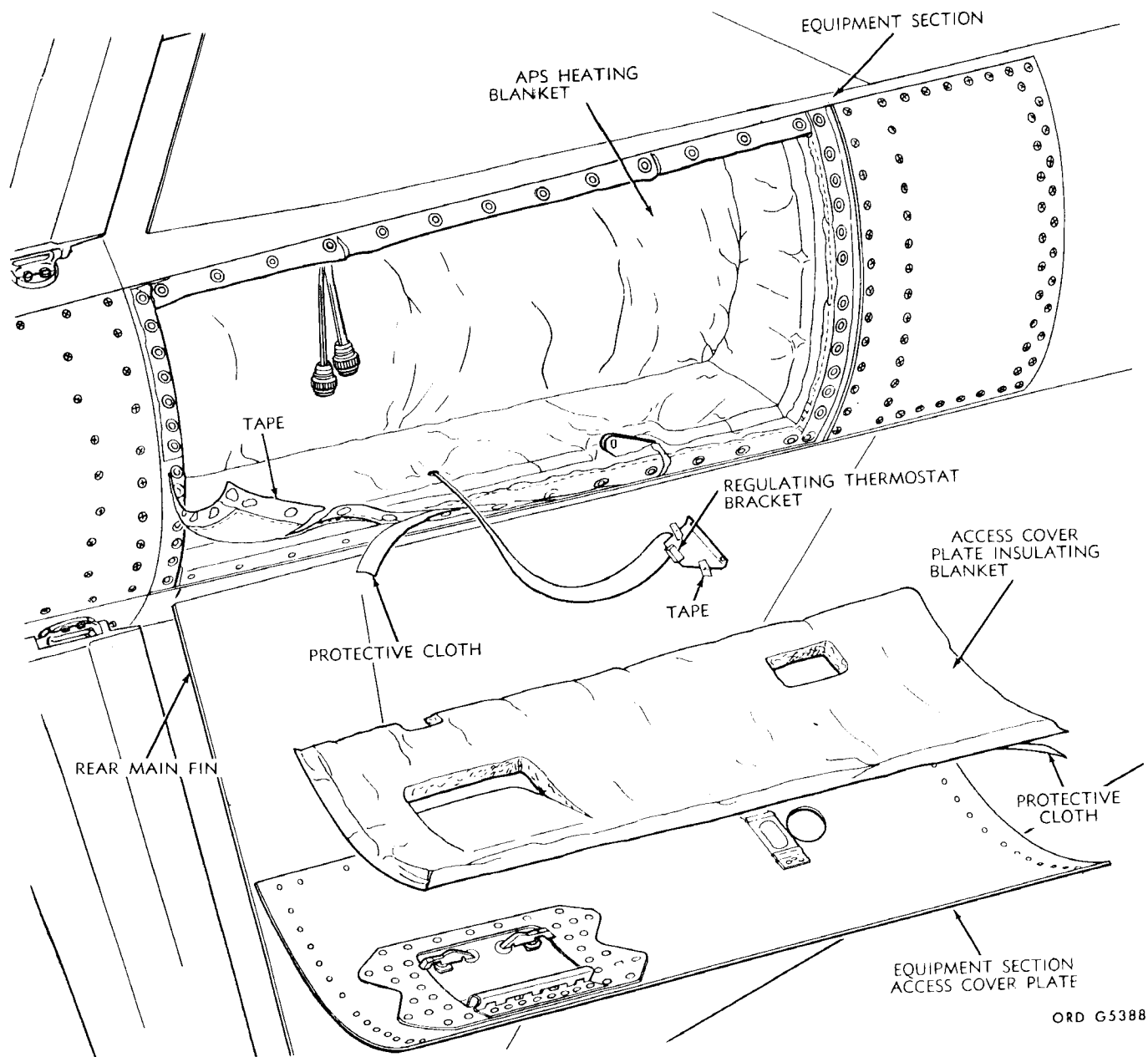
i. Place the regulating thermostat bracket (2) against the control assembly, and align the two holes in the bracket with the holes in the control assembly.

j. Secure the bracket to the control assembly with the roundhead screws and flat washers.

k. Remove the protective cloth (fig. 13-21) from around the edges of the access cover plate insulating blanket.

Note. If the pressure-sensitive tape does not properly adhere, remove the existing adhesive from the tape with dry-cleaning solvent 6850-264-9038. Allow the tape to dry thoroughly, and coat with adhesive 8040-614-4079.

l. Align the cutouts in the blanket with the corresponding openings on the inside of the equipment section access cover plate, and secure in place by pressing the adhesive edges of the blanket against the inside of the cover plate.



ORD G5388

Figure 13-21. Removal and installation of the APS heating blanket and access cover plate insulating blanket.

m. Install the equipment section access cover plate on the left side of the missile.

n. Install safety-and-arming devices M30A1 (par. 10-5).

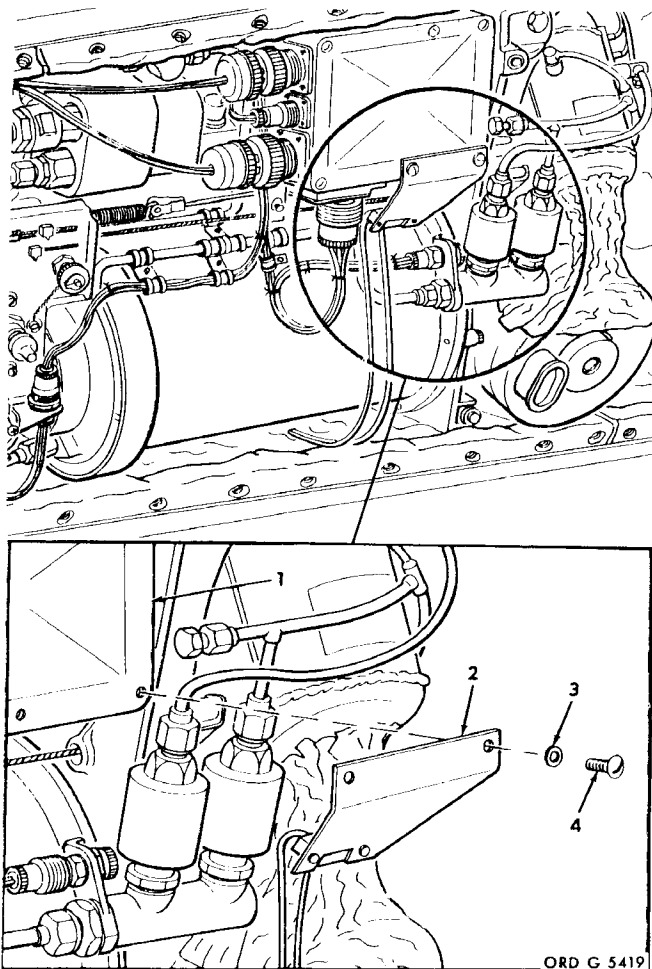
13-23. Removal of the APS Winterization Kit

a. Check that the shorting connector (fig. 10-9) is installed on rocket motor igniter cable assembly connector P109A.

b. Remove the two safety-and-arming devices (11-4a through c).

c. Remove the flathead screws (2, fig. 11-1), and remove the IGNITOR access cover plate (3).

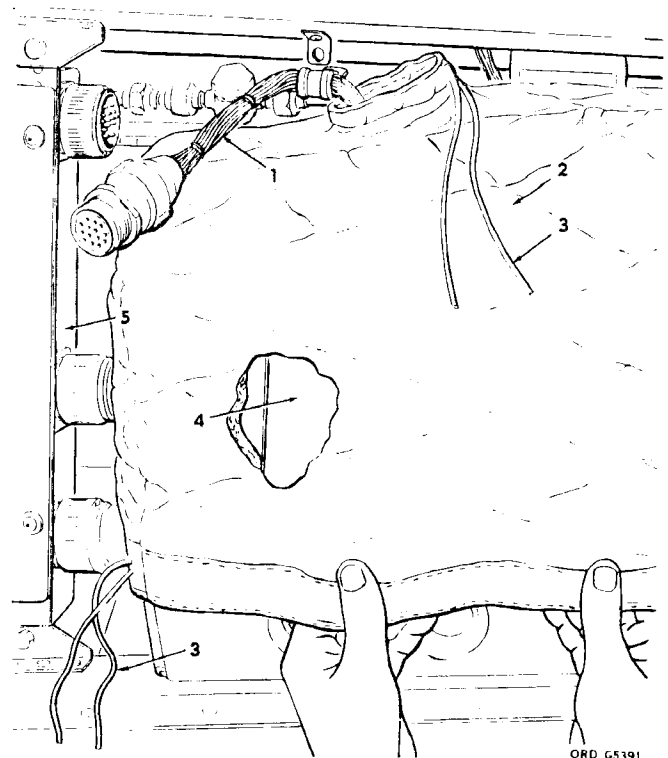
d. Depress the PUSH TO RESET switch (fig. 5-13) on safety-and-arming switch S31, located above the IGNITOR access cover plate. Check that the green field is visible through the inspection window (view A) of S31.



- 1—Control assembly
- 2—Regulating thermostat bracket (part of APS heating blanket 9027080)
- 3—No. 6 fl washer (2)
- 4—No. 6-32 rd-hd screw (2)

Figure 13-22. Removal and installation of the regulating thermostat bracket.

- e. Remove the equipment section access cover plate from the right side of the missile.
- f. Remove the two lower right side round-head screws (4, fig. 13-22) and two flat washers (3) that secure the regulating thermostat bracket (2) to the control assembly (1); remove the bracket.
- g. Reinstall the roundhead screws (4) and flat washers on the control assembly.
- h. Remove the APS from the equipment section (par. 12-69a).
- i. Pull the tape (fig. 13-21) from the edges of the equipment section.



- 1—Battery wiring harness
- 2—Battery box insulation blanket
- 3—Drawstring
- 4—Missile battery box
- 5—Missile distribution box

Figure 13-23. Removal and installation of the battery box insulation blanket.

- j. Disconnect connector P520 (2, fig. 13-20) from connector J520 (3) and remove the APS heating blanket (4).

- k. Remove the access cover plate insulating blanket from the equipment section access cover plate.

- l. Install the APS (par. 12-69b).

13-24. Removal of the Missile Box Blanket

- a. Check that the shorting connector (fig. 10-9) is installed on rocket motor igniter cable assembly connector P109A.
- b. Remove the two safety-and-arwing devices (par. 11-4a through c).
- c. Remove the flathead screws (2, fig. 11-1) and remove the IGNITOR access cover plate (3).

d. Depress the PUSH TO RESET switch (fig. 5-13) on safety-and-arming switch S31, located above the IGNITOR access cover plate. Check that the green field is visible through the inspection window (view A) of S31.

e. Remove the left equipment section access cover plate.

f. Disconnect connector J510 on the battery wiring harness from connector P510 on the missile distribution box.

g. Remove the truss-head screw, flat washer, and lockwasher that secure the loop clamp to the missile structure; remove the clamp from the structure.

h. Loosen the drawstrings (3, fig. 13-23)

around the top and bottom of the battery box insulation blanket; remove the blanket.

i. Install the loop clamp, and secure with the truss-head screw, flat washer, and lockwasher.

j. Connect connector J510 on the battery wiring harness (1) to connector P510 on the missile distribution box (5).

k. Install the flathead screws (2, fig. 11-1) to secure the IGNITOR access cover plate (3) to the rear body section (1).

l. Install the left equipment section access cover plate.

m. Install safety-and-arming devices M30A1 (par. 10-5).

Section IV. CORRECTIVE MAINTENANCE OF WINTERIZATION KITS

13-25. Replacement of Rocket Motor Cluster Heating Blankets

a. Removal.

(1) Prepare for the removal of the rocket motor cluster heating blankets (par. 13-18).

(2) Remove the rocket motor cluster fin assemblies and fairings (par. 13-19a through j).

Note. The procedures in (3) through (6) below apply to any one of the rocket motors upon which heating blanket is to be replaced.

(3) Twist the snaps (1, fig. 13-13) in either direction and release the collar (2) from the snaps.

(4) Remove the retaining clip (3) that secures the collar.

(5) Remove the self-locking hexagon nut (11) that secures the clamp (12); remove the clamp.

(6) Remove the hexagon nuts (14) and flat washers (15) that secure the hook bolts (13) to cover; remove the hook bolts.

Caution: Care must be exercised to prevent damage to the capillary tubes (5, 13-12) when performing (7) or (8) below.

Note. Perform (7) below if a blanket is to be removed from a lower rocket motor.

(7) Position the blanket on the rocket motor cluster truck.

Note. Perform (8) below if a blanket is to be removed from a upper rocket motor.

(8) Lift the blanket above the rocket motor.

Caution: Care must be exercised to prevent damage to the capillary tubes (5) when the thermometer bulbs (1) are being removed.

(9) Slide the three thermometer bulbs from the thermometer bulb receivers (3) and guides (4).

(10) Remove the blanket.

b. Installation.

Note. Perform (1) through (3) below if a blanket is to be installed on a lower rocket motor.

Note. When installing a blanket, start feeding the flat edge of the blanket with the collar to the rear, up between the lower rocket motors.

(1) Position the blanket (2, fig. 13-12) with the collar and the heater cable (view A) to the rear for the lower rocket motor on the rocket motor cluster.

(2) Guide the heater cable through the fitting assemblies, and allow the cable to hang between the lower nozzles.

- (3) Install the three thermometer bulbs (3, fig. 13-12) as prescribed in (a) and (b) below.

Caution: Care must be exercised to prevent crossing the capillary tubes while performing (a) and (b) below.

- (a) Feed the three thermometer bulbs forward, and thread each bulb through the guides.
- (b) Position each thermometer bulb in its respective thermometer bulb receiver.

Note. Perform (4) through (6) below if a blanket is to be installed on an upper rocket motor.

Note. When installing a blanket, start feeding the flat edge of the blanket with the collar to the rear, down between the upper rocket motors.

- (4) Position a blanket with the collar to the rear, over the upper rocket motor.
- (5) Guide the heater cable (view A) through the fitting assemblies, and allow the heater cable to hang between the lower nozzles.
- (6) Install the three thermometer bulbs (fig. 13-12) as prescribed in (a) and (b) below.
 - (a) Lift the blanket; feed the three thermometer bulbs forward; and thread each bulb through the guides.
 - (b) Position each thermometer bulb in its respective thermometer bulb receiver.
- (7) Complete the installation of the heating blankets (pars. 13-12 g through p).
- (8) Install the fairings and the fin assemblies (par. 13-13 through 13-15).
- (9) Join the missile body to the rocket motor cluster, and perform final installation (par. 13-16).
- (10) Install the heater cable shearing clamp (par. 13-17).

13-26. Repair of Punctured Rocket Motor Cluster Heating Blankets

Note. In the event that either of the heating blankets (fig. 13-7) is inadvertently punctured during uncrating or installation, it will be repaired as prescribed in a through g below.

a. Using neoprene-coated nylon cloth 90200-22, cut a patch of sufficient size to cover the puncture by a minimum of 1 inch on all sides of the puncture.

b. Slightly roughen the faying (joining) surfaces of the blanket and patch, using wet or dry medium-grit carborundum paper 5350-271-7991.

c. Clean the roughened faying surfaces with a clean cloth, dampened with toluene 6810-281-2002. Care must be taken to rotate the dampened cloth to assure clean faying surfaces. Allow the toluene to dry one-half to one hour.

d. Apply a thin, even brush coat of adhesive 8040-221-3811 to both faying surfaces.

e. Allow the adhesive to dry until tacky, usually 10 to 15 minutes, or until the adhesive does not transfer to the hand when lightly touched.

f. Before allowing the faying surfaces of the patch to come in contact with the prepared surfaces of the blanket, assure proper position.

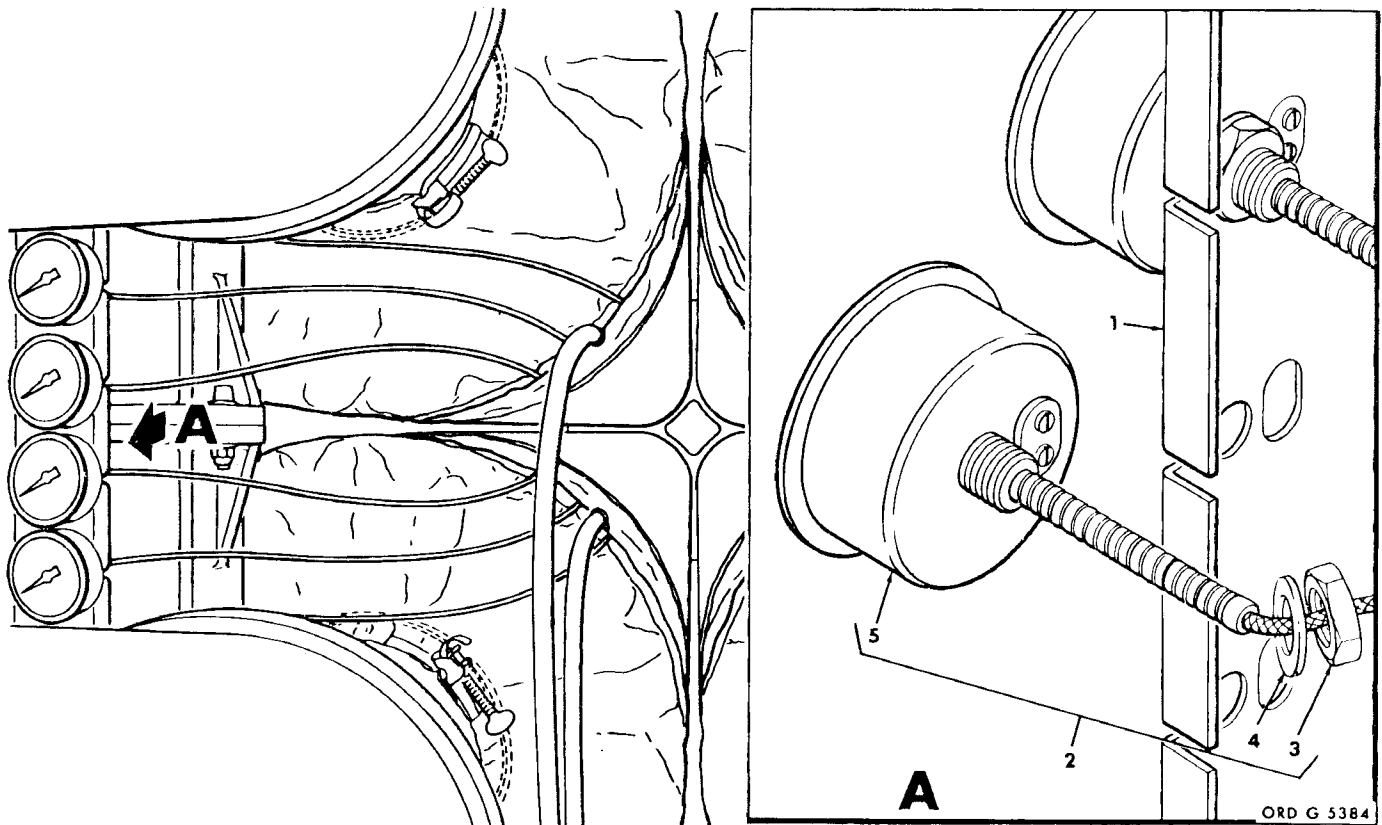
g. Press the prepared surfaces of the patch and blanket together, using maximum hand pressure or a hard hand roller.

Caution: Care should be exercised to protect the repaired blanket from severe handling for 8 hours.

13-27. Replacement of Indicating Thermometer

a. Removal.

- (1) Deactivate the missile (par. 13-25a (1) through (10)).
- (2) Remove the hexagon nut (3, fig. 13-24) and flat washer (4) from the indicator (5).
- (3) Remove the thermometer from the support bracket (1).
- (4) Slide the thermometer bulb (1, fig. 13-12) from the thermometer bulb receiver (3) and guide (4).



- 1—Support bracket 9019229
- 2—Indicating thermometer
- 3—Hex nut

- 4—Fl washer
- 5—Indicator

Figure 13-24. Removal and installation of the indicating thermometer.

b. Installation.

- (1) Install the indicating thermometer (2) as prescribed in (a) through (d) below.

Caution: Care must be exercised to prevent damage to the capillary tube while performing (a) through (d) below.

- (a) Feed the thermometer bulb forward, and thread through each guide.
- (b) Position the thermometer bulb in the thermometer bulb receiver.
- (c) Remove the hexagon nut (3, fig.

13-24) and flat washer (4) from the indicator (5).

- (d) Position the indicating thermometer (2) on the support bracket (1), and secure with the nut and washer.
- (2) Install the cover (par. 13-12g through p).
- (3) Install the honeycomb fairings (par. 13-13).
- (4) Install the top and bottom fairing (par. 13-14).
- (5) Install the side fairings (par. 13-15).
- (6) Assemble the missile (par. 13-16).
- (7) Install the heater cable shearing clamp (par. 13-17).